THE BRITISH JOURNAL

OF

OPHTHALMOLOGY

FEBRUARY, 1933

COMMUNICATIONS

SUPERFICIAL PUNCTATE KERATITIS

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"SUPERFICIAL punctate keratitis is a morphological conception."* That is to say, the title is applicable to any corneal affection in which the lesion consists of opaque dots involving the epithelium, Bowman's membrane, or the superficial layers of the substantia propria. It has been repeatedly shown that such a clinical picture can be created by a variety of pathological processes, and that it may also arise without any obvious cause. The more numerous the dots, the more densely will they be aggregated, and there is a tendency for adjacent dots to coalesce with each other, with the result that any case coming for the first time under observation at a late stage of the disease may present appearances to which the adjective punctate may seem inapplicable. Nevertheless, it is unusual for the whole extent of the cornea to be uniformly involved. Therefore a close scrutiny of the less opaque portions will nearly always disclose the punctate character of the original lesions.

Koby's conception of the meaning of superficial punctate keratitis has been criticised on the ground that the term was originally applied by Fuchs to a definite clinical condition with which most ophthalmologists are familiar. I am opposed to this criticism, because clinical and pathological descriptions published by many observers in various countries differ from each other not only in

* Koby's Slit-Lamp Microscopy of the Living Eye. Translated by Goulden and Harris, 2nd Edition, p. 161, London, 1930.

minute details but in important features. For example, the characteristic position of the punctate opacities was in Fuchs' experience central. Nuel, on the other hand, found them more often at the periphery. A majority of Fuchs' cases were unilateral. Nearly all those of Nuel were bilateral. Yet in most other respects the clinical notes of Nuel closely accord with those of Fuchs. Moreover, many instances of border-line or transitional cases have been seen, especially during periods of epidemic superficial punctate keratitis in Austria, India, and elsewhere. Personal observations and study of the literature alike induce me to believe that only confusion can arise from an attempt to limit the term to one definite disease. It should be applied without prejudice to a group of conditions which may differ widely from each other concerning their aetiology, duration, and clinical signs.

Review of the Literature

The classical paper on superficial punctate keratitis published by Fuchs in 1889 was based on his experience with 38 cases, whose ages ranged from 7 to 52 years. The second decade was the most commonly affected. Neither sex predominated. Two-thirds of the cases were unilateral. The onset of the disease resembled that of an acute catarrhal conjunctivitis in many particulars, but pain, lacrymation, and photophobia were prominent features. Ciliary injection was also mentioned as a point of differentiation from ordinary conjunctivitis. Corneal lesions manifested themselves about four days after the first symptoms. In the meantime the conjunctival affection had often seemed completely to subside. At this stage a number of gray dots appeared on the cornea, and showed a preference for the central rather than the peripheral portion of that structure. The dots were small, rounded, sharply-defined and gray, the intensity of the gray being accentuated at the centre of each dot. Increase in the size and number of the dots might be observed in the course of the next few days, but a single dot rarely exceeded 0·5 mm. in diameter, although the coalescence of several adjacent ones might subsequently appear to break this rule. In many cases the dots were arranged in rows, or else agglomerated like staphylococci. Careful employment of a magnifying lens showed Fuchs that each dot consisted of a number of fine points of opacity, more closely aggregated at the centre. He judged their situation to be immediately beneath Bowman's membrane. Knob-like elevations were noted of the epithelium overlying the dots. Faint striae sometimes occurred as a transient phenomenon in the substantia propria. Other important clinical features were diminution in corneal sensibility, and hyperaemia of the iris. As a result of this engorgement of the iris vessels

miosis occurred, and the pupil's response to the action of atropine was delayed, but in no case did posterior synechiae supervene. The tension of the affected eye was usually normal; only a few cases showed hypotonia. Acute symptoms rarely lasted more than a few weeks, but a minor degree of irritability often persisted until the disappearance of the gray dots—a process that went on gradually until 1-2 years after their original development. True recurrence was never seen, although there might be repeated slight relapses. Fuchs did not profess to know the cause of superficial punctate keratitis, but he was inclined to ascribe it to some form of chill for two reasons: first, the incidence increased in time of winter; secondly, the onset was often associated with acute catarrhal affections of the respiratory tract.

Adler, on the other hand, was unable to detect any association with respiratory disease in his series of 29 cases. His first glimpse of superficial punctate keratitis is interesting because the manner thereof must be paralleled in the reminiscences of many ophthalmologists. In 1888 Adler was confronted by a girl, aged 14 years, who appeared to be suffering from ordinary acute conjunctivitis—a malady which at that time happened to be prevalent in his practice. The customary simple remedies were prescribed, and she was told that her eyes would recover within a few days. On the eighth day, however, she complained that the left eye "saw through a veil," whereas the other eye had completely recovered. This disability of the left eye was due to multiple opacities involving the superficial layers of the corneal substance in its axial portion. Adler proceeded to give a most illuminating description of superficial punctate keratitis. He kept the patient under periodical observation, and a whole year elapsed before the dots had entirely faded. Having been taken off his guard by the mode of onset in this case, Adler kept a sharp lookout for others, and was able to collect 28 more within a year.

Herbert investigated over 200 cases of epidemic superficial punctate keratitis in Bombay during the winter of 1900-01. On examining fragments of epithelium scraped from the affected cornea for diagnostic purposes he found, in a high proportion of the sufferers, a feebly-staining, capsulated bacillus. This organism he regarded as being responsible for the disease. On the other hand, several ophthalmologists failed to discover it in similar material obtained during subsequent epidemics. But Herbert's cases were manifestly different in many ways from the characteristic condition described by Fuchs. For example, the corneal opacities had usually dispersed within a month; follicles along the upper border of the upper tarsus were a common finding; some of the peripheral spots stained with fluorescein; the limbus was in most cases thickened.

Thickening of the limbal portion of the ocular conjunctiva is mentioned as a prominent feature in Stellwag's paper, and it is significant that in his experience the periphery of the cornea suffered more than the centre. Nuel also found limbal oedema. Wright and his co-workers came to speak of a "limbal type," in which oedema at the limbus was associated with the presence of dots near the edge of the cornea.

Wright's knowledge was gathered from an Indian epidemic during which over 3,500 cases came under the notice of himself and his colleagues. He can therefore speak with authority on the subject of epidemic superficial punctate keratitis. Many of his negative observations are as important as his positive ones. Thus, for instance, he failed to detect the method by which the disease became disseminated. Most of his numerous inoculation experiments were inconclusive. He remarked the *absence* of antecedent catarrhal or febrile illnesses, of associated herpetic affections of the skin, and of neuralgic pains in the area governed by the Gasserian ganglion. The great majority of Wright's cases were unilateral. Symmetrical pupils were the rule—a striking point of distinction from the Fuchs type, in which we expect to see some degree of miosis in the affected eye. Wright's two papers are particularly valuable in that they stress the enormous variety of clinical appearances, and the existence of transitional cases. Dots of opacity were found singly or in hundreds. Their disposition might be central, peripheral, or quadrantic. All degrees of severity were recorded; there was the mild, straightforward case of only a few weeks' duration at one end of the scale; at the other end were people suffering from disciform keratitis.

A similar gradation in severity had already been reported by Kirkpatrick at the time of the Madras epidemic ten years before these papers of Wright were published. Wright himself had taken the opportunity to examine some of Kirkpatrick's more severe cases with the slit-lamp, and his observations identified them with the clinical condition of keratitis disciformis, as evidenced by involvement of the whole thickness of the cornea, folds in Descemet's membrane, deposits on the endothelium, and bulging of the posterior surface of the cornea into the anterior chamber. In fact, the large masses of simultaneous clinical material placed at the disposal of Wright and Kirkpatrick by these epidemic visitations enabled them to correlate cases which, if they had occurred sporadically, might have appeared to be members of utterly different groups. Additional support is thus given to a suggestion offered by Fuchs in 1901—namely, that superficial punctate keratitis and keratitis disciformis are essentially the same. Among recent writers who have adopted this view, Verhoeff is conspicuous. Verhoeff, indeed, goes further. He has produced a formidable array of

arguments in favour of his belief that not only these two maladies, but acne rosacea keratitis, recurrent abrasion of the cornea, and various other conditions possess one common pathology. All of them, according to Verhoeff, are types of neuropathic keratitis caused by some shock to the ciliary or to the Gasserian ganglion. In the diversity of the clinical signs he can see no obstacle to this thesis. On the contrary, he argues, uniformity would surely be more surprising, when one considers the immense range of toxic substances to which these delicate ganglia may from time to time be exposed.

Operative interference with the Gasserian ganglion has been known to cause a variety of corneal phenomena, whose consideration is outside the scope of this paper. In most cases any corneal damage that may follow the operation bears no close resemblance to superficial punctate keratitis. Paton has, however, seen such a clinical picture become evident after alcohol injection of the Gasserian ganglion. He regarded it as the expression of a very mild form of neuropathic keratitis.

It will be remembered that Grüter produced superficial punctate keratitis in three subjects by inoculation with the contents of herpes Zoster vesicles. This observer has also seen keratitis profunda appear in a case that began with superficial vesicles. He attributes many of these mysterious corneal affections to the action of the herpes virus, which, he says, exists in two forms. The more virulent variety will produce dendritic keratitis. The milder one will result in vesicular keratitis, superficial punctate keratitis, recurrent erosion of the cornea, keratitis disciformis or profunda. Incongruous experimental lesions may, however, be obtained from the same specimen of virus as a consequence of modifications in virulence brought about by the passage of time or by variations in the medium employed. (Grüter's work has however, been severely criticised by Ridley. See *Trans. Ophthal. Soc. U. K.*, Vol. LI, pp. 14 and 15, 1931.)

Trantas made observations on the cornea of some 40 patients suffering from measles. In the great majority he found a condition of superficial punctate keratitis emerging within a few days of the outbreak of the skin rash. Bilateral cases predominated. Age and sex did not appear to modify the incidence. There was no impairment of corneal sensation. At the centre of each affected cornea he discovered an area of epithelial haze, behind which were situated gray spots resembling grains of sand in the anterior layers of the substantia propria. These corneal manifestations were for the most part effaced within a week, and without the need for any treatment. Trantas maintained that similar lesions occur in small-pox, chicken-pox, syphilis, pemphigus, eczema and erythema polymorpha.

Valude identified a streptococcus in the conjunctival sac of the

case reported by him in detail. The staphylococcus was held to be responsible in Watkins' case. Rosenzweig described two examples of superficial punctate keratitis arising in the period of convalescence from influenza. To this question of influenza as a possible factor in the aetiology I propose to return later.

The pathological researches of various observers serve to strengthen the impression that superficial punctate keratitis is not a single disease. Nuel examined slices of cornea shaved from its peripheral region, and the essential condition appeared to him to be a lymph-stasis of the superficial portion of the cornea. He found that the anterior interlamellar spaces were dilated, and that the overlying epithelial cells were oedematous. The actual dots consisted of filamental networks arising in connection with the corneal corpuscles. No adventitious cells were discovered by Nuel. Wehrli, on the other hand, encountered a dense accumulation of lymphocytes in the deeper layers of the epithelium at the affected areas. Stellwag found not only cells, but cocci in the dots. In Verhoeff's case the opacities were disc-shaped necrotic foci immediately beneath Bowman's membrane, and the cellular infiltrates which had invaded adjacent portions of the substantia propria consisted of polymorphonuclear leucocytes. Wright specifically mentions the absence of leucocytic invasion in his specimens.

In the treatment of superficial punctate keratitis a large number of different remedies have been tried, but so far no method appears to have been discovered by means of which the absorption of the corneal opacities can certainly be hastened. So far as the commoner varieties are concerned, nature seldom fails to complete the dispersal of the dots in her own time; but whether that time will be one month or two years is not ascertainable in advance. Nuel's experiences taught him to avoid strong, irritant preparations in cases of superficial punctate keratitis. Chambers' recent paper advocates the same moderation, and he suggests that normal saline solution is as good as any lotion for this purpose. X-ray applications to the cornea have been recommended by several writers.

Personal Observations

The cases presently to be discussed may for descriptive purposes conveniently be described under three main headings:

A. Non-recurrent superficial punctate keratitis, in which the main lesions are situated in the anterior layers of the substantia propria.

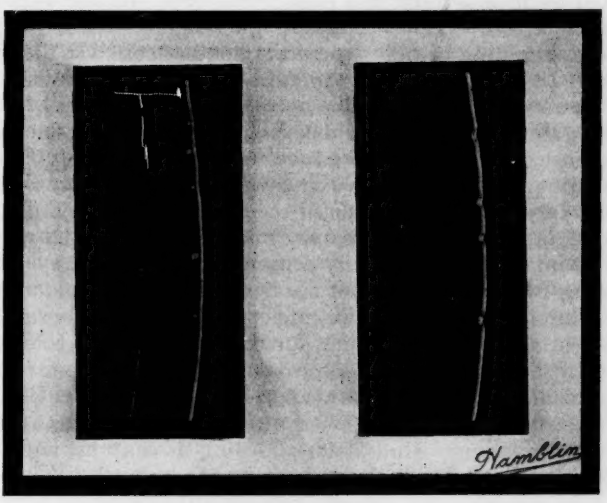
B. Multiple epithelial erosions, with or without involvement of the substantia propria.

C. Miscellaneous conditions in which multiple superficial lesions of the cornea are a prominent feature.

CHILE
MIDDLE

TYPE A and/or B.

A. 43 cases of superficial punctate keratitis of the Fuchs type have been observed, including 19 males and 24 females. The average age of the males was 19 years; that of the females, 27 years. With four exceptions the cases were unilateral. No association with any recent illness or general dyscrasia was detected. In none of these cases was there any loss of epithelium. Some degree of epithelial oedema was, however, invariably present, affecting the whole surface of the cornea sooner or later, although in the early



TYPE A. TYPE B.

stages it was occasionally confined to the immediate neighbourhood of the dots. The rate at which the dots of opacity became absorbed varied from a fortnight to many months. Nearly one-third of these cases showed some impairment of sensation to a light touch on the lids of the affected eye. It is difficult to explain this sensory disturbance without assuming a lesion of some part of the Gasserian ganglion. In all cases there was complete recovery of sensation as soon as the active stage of keratitis had ended.

The onset of this condition is in my experience commoner in winter than in summer. During the winter 1930-31 such cases appeared at different hospitals in London so frequently as to constitute an epidemic visitation. On the other hand, it is possible to do hospital work for months at a time without encountering a single case, and it is during those periods that the physical signs are most likely to be misinterpreted or overlooked.

It is perhaps inevitable that cases seen before the emergence of the corneal dots should often be diagnosed as ordinary conjunctivitis. In a busy out-patient department it is not difficult for the same mistake to occur even when corneal signs have manifested themselves, because these signs may consist merely of two or three small, inconspicuous maculae. The patient's eye is not endangered by this error, although the reputation of the surgeon may be lowered when the patient comes to the height of his discomfort at a time when, according to the original prognosis, he might have expected to have become free from symptoms. I have more than once seen a case diagnosed as foreign body of the cornea, and treated by scraping of that structure. Another case was diagnosed elsewhere as glaucoma. This patient was treated with eserine, and told that an operation would be necessary. In neither of his eyes was there the slightest real evidence of glaucoma. These mistakes can almost always be avoided by attention to careful routine examination. Three illustrative cases of superficial punctate keratitis will now be described.

CASE I, a girl, aged 15 years, came to hospital in November, 1931, giving a history of gritty sensations in the right eye for the preceding two days. I did not see her at her first attendance, but her condition was noted as subacute conjunctivitis of the right eye. One week later, when I saw her for the first time, she complained that the right eye now felt much worse. On examination, conjunctival and ciliary injection were evident in the affected eye. Corrected vision was 6/24. Occupying the centre of the cornea was a closely-set cluster of minute white dots, affording a ready explanation of the visual defect. With the aid of the slit-lamp these dots were located in the anterior layers of the substantia propria. Epithelial oedema and the presence of floating particles in the anterior chamber were noticed. There was total anaesthesia of the right cornea. The skin of the right upper and lower lids was insensitive to light touch, whereas no such abnormality was found on the lids of the unaffected left eye. For the next few weeks this patient was examined at weekly intervals, and remained under treatment with normal saline solution, 0·5 per cent. atropine drops, and dark glasses. The opacities rapidly faded until no trace of them remained at the end of six weeks, by which time the sensation in the cornea and the skin of the lids had become restored, and corrected vision had recovered to 6/5.

CASE II was a boy, aged 10 years, who first came to Moorfields in July, 1930. The right eye was said to have been red and irritable for two months, without any history of trauma or of antecedent illness. Conjunctivitis was present in the right eye. The right cornea showed a multitude of round, gray opacities, situated chiefly in the centre, and involving the superficial layers

of the substantia propria. The whole of the corneal epithelium was oedematous, and numerous particles were floating in the anterior chamber. A moderate degree of engorgement of the iris vessels was observed, but full mydriasis was attained by the use of homatropine, although the response of the right eye to this drug was delayed as compared with that of the unaffected left eye. The right cornea was anaesthetic. Corrected vision in the right eye was 6/36 only. During the next few months further examinations were made at intervals, and the same treatment employed as in Case I. By November, 1930, the dots had definitely begun to retrogress, having become less distinct and less rounded, but at least 30 of them were still visible. A slight feeling of irritability, similar to that which is occasioned by the presence of a foreign body in the conjunctival sac, was still occasionally noticed by the patient in his right eye. By the beginning of 1931, the only remaining symptom was a sensation of faint haziness in front of the right eye, the corrected vision of which had now recovered to 6/12. Only three small, faint, irregular-shaped opacities could now be detected. In May, 1931, all symptoms and physical signs had disappeared. Corrected vision was 6/6 easily. This last state of affairs was also found on re-examination during September, 1931, and there had been no further trouble in the intervening months.

CASE III, a girl, aged 22 years, came complaining of an irritable left eye for the previous three months. Her left corneal opacities were obvious even to naked-eye examination. They were confined to the centre, and were so large and distinct that they recalled to mind the condition of nodular keratitis. The slit-lamp proved that they were situated in the anterior layers of the substantia propria. Corrected vision was reduced to 6/18. When I saw her again three weeks later, I was astonished to find that no trace of the opacities remained. Corrected vision had recovered to 6/9, and would no doubt have been better than this, but for the presence of a considerable astigmatic refractive error.

In the three cases described above, there had been no known disturbance in general health. The fundi were normal. Treatment was limited to simple remedies, which are, in my opinion, at least as valuable as more heroic measures. I have seen cases where strong lotions and repeated applications of silver nitrate have been employed, and my impression is that these strong chemicals merely enhance and prolong the symptoms of irritability.

B. Multiple epithelial erosions of the cornea occur under many different conditions, and are usually accompanied by some disturbance of the adjacent anterior layers of the corneal substance. The vulnerability of corneal epithelium to gonococcal pus is well-known, but it is not uncommon for epithelial loss to be associated with acute conjunctivitis caused by far less virulent organisms.

For example, during the Autumn of 1931 I saw several cases of multiple epithelial erosions with acute conjunctivitis, in which bacteriological examinations revealed only the Koch-Weeks bacillus.

During the convalescent period after an attack of acute infectious disease, people commonly suffer from a conjunctivitis in which lacrymation and blepharospasm are outstanding symptoms. Influenza is particularly prone to be the forerunner of this complaint. Measles and scarlet fever are frequently to blame. In such cases the epithelium of the cornea is seldom intact. On examination there will probably be found multiple staining-points, as well as grey dots representing areas of incompletely healed earlier erosions. If none of the dots takes the fluorescein stain at the time of examination, then the case may closely resemble those of the Fuchs type which have been considered in the previous section. Differentiation is sometimes impossible without recourse to the slit-lamp. This instrument will at once reveal the depth of the opacities, which, if they involve the epithelium as well as the anterior layers of the substance, probably represent healed erosions. The opacities in Fuchs' superficial punctate keratitis are limited to the substantia propria: there will, of course, be some degree of haziness of the overlying epithelium from oedematous changes, but such haziness is easily distinguishable from an opacity that is the result of actual scarring. Some writers have ascribed to influenza the preponderant aetiological rôle in cases of superficial punctate keratitis, and it is certainly true to say that influenza is an important causative factor, provided we accept Koby's definition quoted at the beginning of this paper. It is manifest, however, that some confusion has formerly arisen between the Fuchs variety and the type with multiple erosions. So far as the Fuchs type is concerned, I have never been able to find any relationship with influenza, and I suspect that the connection alleged by some authors is due to their not distinguishing the Fuchs cases from those in which loss of epithelium occurs.

The differentiation of these two groups by means of the slit-lamp is not a matter of mere academic interest or hair-splitting. It has some practical importance in building up a prognosis, because there is great diversity of behaviour between the two groups. In Fuchs' superficial punctate keratitis no true recurrences have been recorded. Although the dots of opacity may endure for as long as two years, and although some degree of irritability may persist until their complete disappearance, yet they do not come back when once they have gone. Thus it is reasonable to tell a patient suffering from this malady that he will in all likelihood steadily improve. Multiple erosions, on the other hand, are apt to behave very differently, especially when they are the sequel of such a

debilitating disease as influenza. Even with comparatively mild attacks, recovery is seldom uninterrupted. A fresh collection of staining-points may appear immediately after the original erosions have healed over. Some of these cases are difficult to distinguish from dendritic ulcer. In this connection I am not referring to the classical type of dendritic ulcer with its well-marked buds and branches, but to a border-line, less well-defined type of case, which begins insidiously, and conceals its dendritic nature for some time. However, it may be that there is no real distinction.

Multiple erosions may also arise in certain factory workers as a result of contact with irritating chemical vapours or fragments of dust. Mustard-gas is one of the substances that affect the cornea in this way. There are men to-day who still suffer from severe relapsing ulceration, the result of burns from mustard-gas 15 years ago. In some cases I have seen multiple erosions appear in healthy adults who could give no history of antecedent illness, nor of trauma, nor of exposure to any noxious substances. It is at least possible that some of these people may have sustained injury from dust or vapour without their having been aware of it at the time.

Multiple erosions of the cornea, however they are caused, may be the prelude to an invasion of the cornea by large superficial blood-vessels developing in continuity with those that supply the conjunctiva. It is well-known that vascularisation is one of the devices employed by Nature to assist in the healing of corneal ulcers, and that these adventitious vessels in a favourable case undergo considerable shrinkage after the completion of their useful purpose, although they seldom or never become entirely obliterated. In many cases of multiple erosion, however, the beneficent purpose of the new-formed vessels is more than counteracted by their obstinate progress toward the centre of the cornea. These superficial vessels may become so large that the whole surface of the cornea is rendered opaque and irregular, so that not only is there serious impairment of vision, but the patient is subjected to recurrent attacks of irritability over a period of many years.

Nobody has yet explained why a lesion that originally seemed to be localized and insignificant may in some patients excite the formation of large, intertwining vessels all over the cornea; whereas, in other patients, a lesion presenting almost identical signs may heal up without any vascular encroachment. I was interested to learn from Mr. F. T. Ridley last year that vascularisation is the normal response of the rabbit's cornea to almost any infection. He found experimentally that various organisms selected at random and deposited on to a small corneal abrasion in one of these animals will nearly always lead to the creation of adventitious vessels.

The distinction between the corneal opacities described in Section A, and those that have been dealt with in Section B, is emphasised in the accompanying slit-lamp diagrams.

CASE IV, a man, aged 49 years, was confined to bed for several days with a sharp attack of influenza. During the first week of convalescence he began to suffer pain in his right eye. The left eye also became painful a few days later, and he therefore attended hospital. He said that both eyes had been similarly affected during convalescence from influenza several times during the previous ten years. On both corneae there were a few small areas which were stained with fluorescein. Multiple small, irregular-shaped nebulae were seen scattered over all portions of the corneae, but chiefly in the lower peripheral regions. On slit-lamp examination the corneal surface in each eye exhibited numerous irregularities in the situation of these nebulae, which were seen to involve the epithelium as well as the anterior layers of the substantia propria. Numerous particles were seen floating in the anterior chamber. The irides appeared normal.

CASE V, a healthy-looking man, aged 20 years, came recently to hospital, complaining that both eyes had suffered from intermittent attacks, often lasting for weeks at a time, of redness and watering during the past year. Until a year ago he had never noticed anything wrong with his eyes. The left one had been the first to suffer. There was no history of trauma. On examination the right eye was white and quiet. A few superficial opacities were observed on the right cornea, situated in the anterior layers of the substantia, and in the epithelium. In the left eye the conjunctiva was much inflamed. Ciliary injection was obvious. Superficial vessels were seen encroaching on the periphery of the cornea for a distance of 2-4 mm. The whole of the surface epithelium was oedematous. At least 50 corneal opacities were present, involving the same layers as those that were seen in the right eye, and showing a preference for the nasal half of the cornea. In neither eye was there any evidence of trachoma.

CASE VI is a girl, aged 17 years, whose right eye has been intermittently irritable for over six years. She has been under my observation at intervals for the last two years. In the right cornea there is well-marked peripheral vascularisation, together with numerous superficial opacities similar to those described in Case V. Whenever she has a recurrence, it is possible to demonstrate a few staining-points on the right cornea. The left eye is normal. General health is excellent.

CASE VII, a man, aged 35 years, came recently to hospital, having suddenly noticed that his left eye could not see so well as his right. He gave a history of both eyes having been bandaged for three weeks after exposure to mustard-gas in 1918. He was more

fortunate than most victims of this injury, in that he had escaped recurrent inflammatory attacks. The corneal appearances in both eyes may best be likened to a combination of nodular and reticular keratitis. The opacities, which involved the epithelium and the anterior layers of the substantia propria, were situated for the most part centrally and below. The fact that they were more abundant in the left than in the right eye amply accounted for the difference in visual acuity noticed by the patient. There were also a few superficial, irregular-shaped hyaline deposits near the limbus. The conjunctival vessels exhibited the "beading" phenomenon—a sign highly characteristic of injury by mustard-gas, and produced by alteration in calibre at frequent intervals along the course of the individual vessels.

C. The following section is intended to deal with a variety of conditions in which multiple superficial lesions of the cornea are a prominent feature.

Oedema of the corneal epithelium occurs with severe conjunctivitis, especially in that variety which is due to the gonococcus. It accompanies raised intra-ocular pressure, and inflammation in any portion of the uveal tract. It can, moreover, be detected in nearly all affections of the cornea. When this oedema has been provoked by some inflammatory trouble deep in the globe, the resulting vacuoles tend to be regularly disposed over the whole surface of the cornea. Individual vacuoles may in these circumstances be small enough to escape detection as such, on being examined through a loupe. They will, however, collectively produce some diminution in the natural polish of the cornea, thereby suggesting the use of the slit-lamp, whose superior magnification will display them.

In epithelial oedema due to corneal affections, on the other hand, we seldom see this fine, uniform "bedewing." There is usually some considerable range of variety in the size of the vacuoles, whose larger examples are visible under such magnification as can be obtained by using the loupe. In many cases the oedema is confined to a fraction of the surface of the cornea, or may be far more advanced in some regions than in others.

Epithelial oedema can be seen localized in the neighbourhood of recent corneal abrasions, old corneal scars, superficial new vessels, and dots of infiltration, although the oedema will, in the last-mentioned condition, probably be more widespread after the initial stages. In Fuchs' epithelial dystrophy the centre of the cornea is the first region to be affected by oedema. A typical case will show numerous large vacuoles at the centre; smaller ones in the paracentral region; and perhaps at the periphery there will be none at all, with the exception of those exceedingly small ones which constitute a normal feature of the zone immediately

within the limbus. Widespread oedema of the corneal epithelium is a characteristic feature of neuropathic keratitis, which, in mild cases, engenders small vacuoles. In severe cases adjacent vacuoles may coalesce with such rapidity that the whole of the epithelium may be floated off within a few hours. Oedematous changes also occur in the corneal cells when they are unduly exposed to the atmosphere, *e.g.*, in severe cases of exophthalmic goitre. In this connection it will be remembered that epithelial oedema represents the earliest stage in band-shaped opacity of the cornea. It is necessary to regard oedema of these cells as the earliest evidence of their degeneration. When the oedema is moderate in amount, and especially when it is due to some removable cause, it does not preclude recovery on the part of the cells concerned. On the other hand, oedema is often merely the forerunner of further degenerative changes.

The walls of the vacuoles that are formed by swollen epithelial cells not uncommonly fail to withstand the pressure of their fluid contents. When they have ruptured, there is a tendency for the surface loss to be made good by the surviving epithelium, but the attempt at repair may be frustrated by the continuance or intensification of those conditions which originally gave rise to oedema. In these circumstances epithelial proliferation may proceed in wasteful and irregular fashion to form the clinical picture of filiform keratitis. The cornea will be dotted with white flakes comprising coils of abortive epithelium. Calcification is another possible sequel of oedema, especially after the oedema has been prolonged. In advanced cases of Fuchs' epithelial dystrophy it is not uncommon for calcareous changes to manifest themselves on the surface of the cornea. Further examples of swollen epithelium becoming calcified will presently be given among the illustrative cases.

During the last two years I have seen at least six instances of a bilateral condition which, for want of a better name, I shall designate "granular substantia propria." On examining this type of cornea with a loupe, one is at first puzzled. In the corneal substance there are irregular-shaped grey areas with indistinct margins. Surface polish is unimpaired. With the slit-lamp these grey irregularities appear to consist of broken and distorted corneal lamellae, reminiscent of that broken vitreous framework which is so constantly to be seen in severe uveitis. In the first case of "granular substantia propria" that came to my notice, the grey areas were most abundant in the centre of the cornea; under the magnification of a loupe they were sufficiently obvious to be described as opacities; but I was surprised to find that the patient's vision was normal. I noticed the same absence of visual impairment in cases seen subsequently. It occurred to me that a parallel,

or at least an analogous non-interference with vision was associated with relief of the adult nucleus—a phenomenon which, even in its most exaggerated form, does not indicate defective vision.

Recurrent corneal abrasion is a term that covers a multitude of diverse clinical appearances. It was originally intended to express the conception that, after partial denudation of the corneal epithelium by a scratch, the resulting defect may be repaired by cells whose abnormally loose attachment exposes them to the risk of being plucked off by sudden movements of the upper eyelid, even after many months have elapsed since the original lesion. That this theory may account for some of the cases it is impossible to deny. It is equally impossible to accept the same explanation for all of them. I have on several occasions been able to observe, in patients whose clinical behaviour in all other respects imitated the classical recurrent abrasion, that the lesion at the second attack was in fact remote from the original abrasion. In other cases the corneal trouble, having first presented the appearances of a recurrent abrasion, may finally display the signs of superficial punctate keratitis. Opacities of all shapes and sizes may develop. Relapses and recurrences may be numerous, until the vision of the affected eye is much reduced.

It would be superfluous in this paper to comment in detail on nodular keratitis and leprosy of the cornea, although the possibility of these conditions must sometimes be considered in the diagnosis of a difficult case. Acne rosacea, on the other hand, is sufficiently common to deserve consideration. It is well-known that, in a minority of cases of this disease, the ocular manifestations may precede those of the face, thereby leading to confusion in diagnosis. Furthermore, the cornea may be dotted with small opacities before it has undergone the characteristic vascularisation. The conclusion to be drawn is obvious. A patient in the early stages of acne rosacea may at first appear to be suffering from those varieties of superficial punctate keratitis which were considered in Sections A and B.

Multiple foreign bodies embedded in the cornea may be confused with superficial punctate keratitis. Another possible source of fallacy arises when some trivial affection, *e.g.*, conjunctivitis or a small corneal abrasion, happens to attack an eye whose cornea is studded with dots marking the site of former foreign bodies. Unless care is exercised in the examination, these opacities may be confused with active infiltrates, and so lead to an incorrect diagnosis of superficial punctate keratitis. Such mistakes are rendered far less likely by the use of the slit-lamp in all doubtful cases.

CASE *VIII*, a woman, aged 60 years, came to hospital in September, 1930, complaining of failure in the vision of the left

eye for the previous three years. On examination the right eye showed epithelial bedewing all over the cornea, numerous opacities, vacuoles and crystals in the anterior cortex, early cupuliform cataract, vitreous floaters, old central choroiditis, and attenuated retinal arteries. Corrected vision was 6/24. In the left eye there was an even more pronounced bedewing of the corneal epithelium. Many pigment granules were seen on the back of the cornea, but the endothelium appeared healthy. A hypermature cataract was present. Vision was limited to the appreciation of hand movements. A few months later the left lens was extracted, the anterior chamber irrigated, and the greatly thickened anterior capsule removed. She recovered well from the operation, and six weeks later underwent a left needling operation, after which her corrected vision was 6/12 partly. Fundus examination revealed large patches of old choroiditis. Six months after the cataract extraction the left cornea showed numerous white, apparently calcareous dots confined to the epithelium, scattered more abundantly at the centre than in the upper portion, and still more abundantly down below. Corneal sensation was normal. Corrected vision was maintained at 6/12 partly.

CASE IX is another example of calcareous changes following prolonged epithelial oedema. The patient is a woman, aged 56 years, who has suffered from lack of sensation in the area supplied by the first division of the fifth right cranial nerve ever since an operation 15 years ago. The right cornea was of course completely anaesthetic. Flat vesicles, irregular in shape and in size, were seen over most of the surface of the cornea, but in the central region many white dots were seen to have replaced the vesicles. Corrected vision in this eye was 6/36; in the fellow eye, 6/9. Early diabetic retinitis was present in each eye.

CASE X, a woman, aged 53 years, was first seen at hospital in October, 1931. She was diagnosed as right conjunctivitis, painted with silver nitrate, and given a lotion containing boracic acid and zinc. One month later, when I saw her for the first time, she said that her right eye was still more uncomfortable. In addition to the right conjunctivitis, it was now possible to see that the right cornea was oedematous over its whole surface. On the lower portion of the cornea, where the oedema was most intense, there were a few white dots involving the epithelium and the anterior layers of the substantia propria. One month later the left cornea was dotted with a few similar opacities, and conjunctivitis was present in this eye also. After the lapse of another fortnight there were no opacities to be seen on the left cornea. The right cornea showed some closely-set dots on the lower and inner quadrant, but many of those that were previously seen had disappeared. When I saw this patient again five months later, she had a typical

acne rosacea of the face. She assured me that her face had never before suffered in this way. I have very little doubt that later she will proceed to develope acne rosacea keratitis in its more characteristic form.

CASE XI, a woman, aged 52 years, has had irritable eyes for four and a half years. For the last ten years she has suffered from dryness of the mouth. There has been no appreciable change in her condition since she began to come for periodical examinations nearly three years ago. The tongue is exceedingly dry, large, and wrinkled. There is bilateral enlargement of the parotid and submaxillary salivary glands. Conjunctivitis is present on both sides. She cannot form tears. Both corneae show roughening of their surface, superficial gray opacities, and tags of swollen, irregularly proliferated epithelium. She has undergone a short course of local X-ray applications for the corneal condition within the last six months, but no benefit has accrued. Normal saline lotion and parolein drops afford her more relief than any other of the remedies employed. It is said that deficiency in the lacrymal secretion does not of itself deprive the cornea and conjunctival sac of their proper lubrication. If this statement be true, then one must also assume some derangement of her accessory conjunctival glands.

CASE XII, a man, aged 24 years, recently attended hospital with a history of gritty sensations in the right eye for one month, and in the left eye for two months. There were many small, superficial opacities on each cornea. Both conjunctivae were somewhat inflamed. On examination with the slit-lamp the opacities were seen to involve the epithelium as well as the anterior layers of the substantia propria. A number of golden granules were found embedded near the surface of each cornea. Enquiry revealed that the patient was working in a sulphurous atmosphere, and was often employed in scraping-off paint. This case of multiple foreign bodies had been, on preliminary investigation with a loupe, most suggestive of superficial punctate keratitis.

I desire to thank all the surgeons at Moorfields Eye Hospital for their kindness in allowing me to make these observations on the patients under their care. To Sir John Parsons and to Mr. Charles Goulden I am particularly indebted for the encouragement and the clinical instruction which they have so generously given.

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SCOTOMATA IN MIGRAINOUS SUBJECTS

BY

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BIRMINGHAM

THE cause of migraine is, so far, wrapped in mystery and is likely to be elucidated only by a careful study of a large number of cases. For this reason I feel that the two following examples may be of some interest, in that they both had definite scotomata that could be accurately mapped out, and that in both there was a possibility of papilloedema. I say a *possibility* because there are many discs of the "embryonic" type, shewing sheaths on the vessels, and films over the disc that are difficult to distinguish from the appearance left by a past neuritis. In the first case this condition was found on one side only, and this was the side affected. The embryonic discs are generally bilateral. In the other case the appearances on one side seemed to be more marked on a second examination. Probably in both cases the discs were of the embryonic type, and the association with other symptoms was a coincidence.

The notes of the two cases are as follows :—

Mr. T. J. W., aged 47 years. *History*.—From the age of 15 to 35 years he was subject to violent headaches associated with spots before his eyes, scintillating scotomata, hemianopia, and numbness in the arms. For the past 12 years he has been completely free from headache and other symptoms of migraine.

A month ago he was making adjustments to his car with the engine running in a closed garage. He became giddy, and when he recovered from this vertigo he found that he was practically blind in the right eye. This blindness was almost complete, but he had some perception of light. He also had violent pain in the right frontal and parietal region, but he has had no recurrence of scintillating scotomata or numbness in the arm. The sight of the right eye gradually improved but is still very poor.

Condition when seen on July 13, 1931.

V. R.=5/60. Not improved with glasses.

V. L.=6/4.

No material error of refraction.

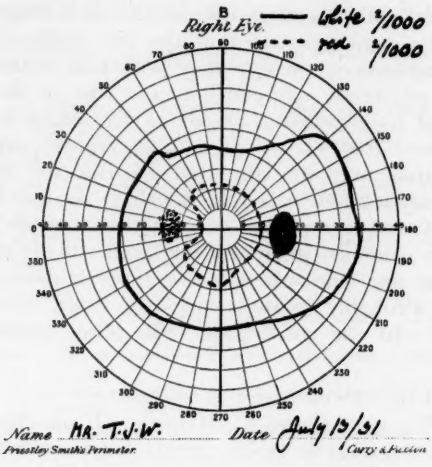
Fundi: the right disc shews an appearance which might be due to a past neuritis, but could also be caused by the persistence of embryonic structures. The nasal edge is blurred, there is a delicate filmy appearance on the surface of the disc, and there are sheaths on the arteries on the discs.

The left disc is normal.

Fields. The left field is normal.

The right field for white shews general contraction.

The field for red shews a reniform contraction on the nasal side. There is a relative scotoma on the nasal side. It is of the same size as the normal blind spot, and is in a position on the nasal



side of the field symmetrical with that of the actual blind spot. One may say that in this eye there are two blind spots, one on each side of the fixation point.

The patient still complains of pain in the right frontal and parietal areas.

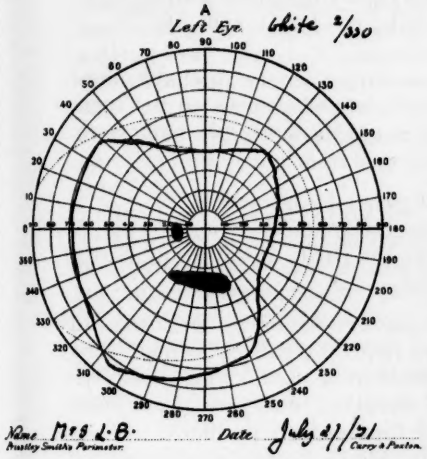
He was examined by a physician who found nothing wrong with his central nervous system. He was of the opinion that he was suffering from migraine and carbon-monoxide poisoning.

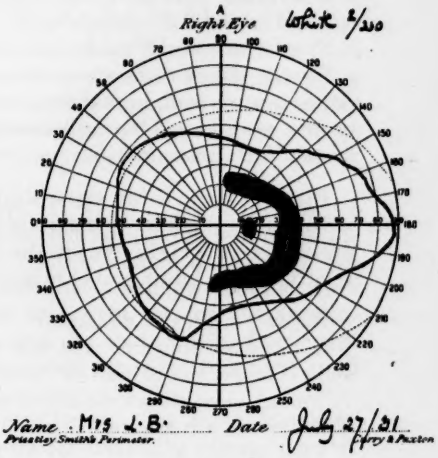
Unfortunately, being a private patient, I saw him once only, and was unable to get any X-ray pictures of his sellar region. My information from his doctor is that he has made a complete recovery and now has good acuity in the right eye.

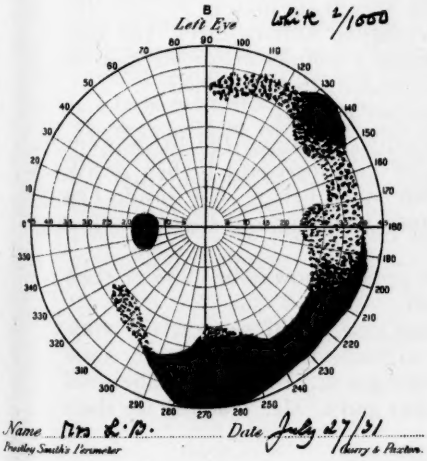
Mr. Hugh Cairns, whose advice I sought upon this case, writes as follows:—"I would not like to venture an opinion on the cause of the scotoma, and the alteration in the red field, though it seems to me that with a history of sudden blindness and the appearance of the disc that you describe, a destruction of a few fibres of the optic nerve might conceivably occur anywhere. Taking the rest of the case as a whole from the information that you give me, it

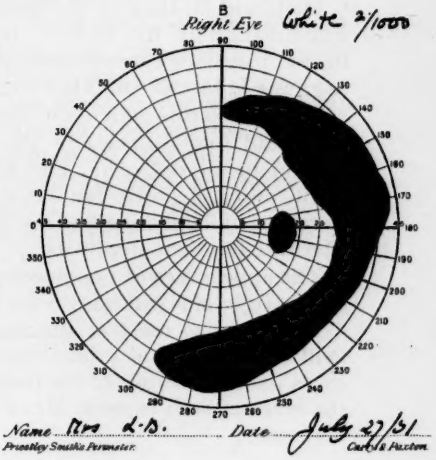
seems most likely that this man has an aneurysm. I have seen several cases of aneurysm that were preceded by a long history of migraine, and furthermore the sudden failure of vision limited to one eye, and followed by complete recovery is very suggestive. Under such circumstances I should expect that a good X-ray picture would shew erosion of the right anterior clinoid process."

Mrs. L. B., aged 45 years. *History*.—For years has suffered from violent headaches especially at the menstrual periods,









associated with scintillating scotomata. She vomits and suffers from frequent nausea. She is now getting symptoms of the menopause. During the past five years she has had attacks of vertigo. About eighteen months ago she had visual hallucinations of an organised type. She saw a man's form. Her husband states that his wife's temper has been getting very bad, and that she has become very difficult to live with.

Condition when first seen July 15, 1931. A highly neurotic woman. Below the left eye there is a haemangiomatous area.

V. R. c.+1·0 D. sph.=6/7·5. V.L. c.+1·0 D. sph.=6/7·5

8° of near and 12° of far esophoria.

Fundi: Both discs shew tenuous films over the disc, the nasal edges are blurred, and there are well-defined sheaths on the roots of the arteries. This appearance suggests either an embryonic "rest," or a past neuritis.

Fields. Both fields shew slight general contraction.

In each there is a hemianopic crescentic scotoma. This is absolute in the right eye; in the left it is partly absolute and partly relative. The blind spots are normal.

X-ray pictures of the skull. These were taken by Dr. Edmund Jones of Leamington. He reports that the skull is normal. The sella is large, but cannot be considered to be pathologically altered. A lateral view shews no signs of increased intra-cranial pressure. The sinuses are normal. The optic foramina are normal.

The patient was referred to Mr. Hugh Cairns who examined her on October 7, 1931.

He found no trace of the annular scotomata present on July 27. Examination of the C.N.S. revealed no abnormality. He was unable from one examination to make a definite diagnosis, but he suggested that the condition might be due to an aneurysm.

I examined this patient on November 30, 1931.

I could find no trace of the annular scotoma, the fields were normal in all respects. The acuity had increased to 6/6 partly right, and 6/5 partly left. She felt much better. Her headaches were less violent. She had occasional vomiting and slight vertigo. She still felt very depressed.

The appearance of papilloedema appears now to be more marked on the right side but less on the left.

It seemed to me that the second case might support the view held by Fisher and others that migraine is at any rate in some cases due to swelling of the pituitary gland. I therefore submitted the notes of both cases to Mr. Fisher and to Mr. Traquair for their opinions.

Mr. Traquair writes as follows.—"Mr. T. J. W. This case might well be due to vascular spasm. The history of migraine in his younger days is suggestive. It is evident that the interference must have been either in the right optic nerve or in the retina. It is impossible to exclude an aneurysm, but there is no evidence of this. Mrs. L. B. This case appears to me to be an ordinary migraine with temporary hemianopic scotomata. Here again the possibility of aneurysm cannot be absolutely excluded, though there is no positive evidence. The difficulty in this case is the increasing papilloedema. If this is actually the case some definite lesion must be present. It is true that recently in some cases with a history of "migraine" aneurysms have been discovered and from this a tendency has arisen to assume that any case of migraine may be due to an aneurysm of the Circle of Willis, but such are usually associated with more definite evidence of permanent change such as paresis of an ocular muscle or definite field changes of hemianopic type."

Mr. J. H. Fisher writes:—"Mr. T. J. W. I am inclined to agree with Cairns, and do not think that he had carbon monoxide poisoning; if overcome by this he would probably have died if not succoured by someone else. A sudden haemorrhage would account for his symptoms, and if from an aneurysm, say on the anterior cerebral artery, it might well involve the intra-cranial portion of the right optic nerve. The sudden onset, the rapid blindness, and violent pain all seem to support this theory.

As regards Mrs. L. B.:—I still think that some forms of "migraine" are due to transitory tumefaction of the pituitary body. I think that Mrs. L.B. is one of this type. I do not think that the annular scotomata in this case can be explained by anything but an implication of the optic tract or its central communications. The organised type of hallucination, it is true, suggests a sub-cortical irritation in the left half-vision centre."

I have seen Mrs. L. B. recently and she is very much improved. There has been no recurrence of the annular scotoma, and the headaches are better. I have lost sight of Mr. T. J. W.

I think that the former is a pure case of migraine, but the definite scotomata are most interesting. Mr. T. J. W. probably suffered from a vascular lesion, and the association with migraine is probably fortuitous.

TRACHOMA IN FIJI—AN ORIGINAL INVESTIGATION

BY

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THE islands of Fiji lie in the Southern Pacific, between latitudes 16 and 20 South, and longitude 177 East, and 178 West. The climate is subtropical, the mean maximum temperature being about 82° Fahrenheit, and the mean minimum temperature about 72° Fahrenheit. In the rainy season there is a heavy rainfall—over 100 inches a year, and the relative humidity is very high, the average for the year being about 75° of saturation.

Trachoma is endemic, and very widespread in its incidence amongst the Natives, although no race which lives in the Colony is exempt.

It is remarkable that so serious a disease, which has such crippling effects should have received so little attention in the past by scientific investigators in these islands, but no earlier records are available, and this brief paper appears to be the first serious study of the disease as it occurs in the native Fijians.

The colony of Fiji is remarkable for having a number of distinct races living in close proximity. The vital statistics in round numbers for the year 1929 are as follows:—

Europeans	5,000
Half Castes	3,000
Fijians	92,000
East Indians	73,000
Polynesians	2,000
Chinese	1,500
Others	1,000

The incidence of trachoma amongst the natives varies from district to district. Thus in villages where the general state of cleanliness is low the incidence of trachoma is high. In some villages almost every adult, and most of the children are affected by the disease. On the other hand, in districts where a better type of native is found, and where the general state of living and hygiene is good, cases of trachoma are the exception. This happy state of affairs is the only bright spot in an otherwise dark picture, and incidentally points the way to the only effective means of control.

My investigations were carried out entirely amongst the Fijian natives, and this paper deals with the condition as it occurs amongst them, but the disease is also seen in all the other races that live in Fiji, and can be contracted by recent arrivals in the Colony.

Of the total Fijian population, I should say that at least 20,000 are affected by trachoma. This very wide incidence is not generally recognized for several reasons. In the first place, trachoma, as we see it in Fiji, is an insidious disease. It is not ushered in with any alarming symptoms. In the majority of cases, the disease is contracted in childhood, and the parents are either not aware of, or else pay no attention to, the condition. Later, when the patient is an adult, and the disease has progressed to a stage when the signs of its presence are more obvious, the changes in the eye are frequently attributed to the excessive drinking of Yaqona, the native drink which is prepared from the roots of the Piper Methysticum, or Kava plant, and which is familiar in most of the Pacific islands.

Such indifference to so dreadful a disease is typical of the native indolence; and in my experience, the only patients who ever presented themselves for treatment were those who suffered from ulceration of the cornea, which is a comparatively late complication. Native Fijians regard it almost as a matter of course that old people should suffer destructive changes in the eye, with total or partial loss of vision, and the blindness with which so many of the older members of their race are afflicted is more a matter for ridicule than pity.

Owing to the lack of earlier investigations, no history of the disease in Fiji is available, and its original source is buried in doubt. Either the disease has been with the Fijians since time immemorial, or else it has been introduced into these islands by early visitors.

There is no evidence to show that trachoma amongst the Fijians is of foreign, and, therefore, of comparatively recent origin. All the evidence points in the opposite direction. Thus there are several genuine Fijian words for the disease and its various manifestations—it is known as *Bulewa*. All Fijians are familiar with the gross physical signs; they regard the disease with indifference, as I have already mentioned, and certain native remedies are practised throughout Fiji.

Were trachoma of foreign origin, we would expect some indication of its source by the name by which it is known to the natives, just as measles, for example, is known to them as *Misila*, which is sufficient evidence of whence it came.

Symptoms and Signs

No child, in my experience, was ever brought up for treatment in the early stages, and the condition was seen only during routine examination.

The granules vary to some extent in size and position. They may be present over the whole of both upper and lower lids, in

which case they bear a striking resemblance to the follicles of follicular conjunctivitis, and can be distinguished from that disease only by their subsequent course. This stage is known to the Fijians as *Kakandra* (*Fig. 1*).

In other less exuberant cases, the granules are scattered more sparsely over the palpebral conjunctiva (*Fig. 2.*)

When the disease has been present for a year or more, a very definite facies—the trachomatous facies—results, which a little

FIG. 1.

Trachoma in a Fijian boy aged four years.

FIG. 2.

Showing typical 'Sago Grains' scattered in upper lid, in a child aged seven years.

experience allows to be recognized at a glance. It is due to the ptosis and photophobia which characterize this condition (Fig. 3.)

Fig. 3 is of a comparatively early case, in which marked ptosis has not yet occurred, but in which the thickening of the lower lid can be recognized by the groove below it. The thickening of the upper lid is more obvious when it is everted.

The ptosis is produced by the involvement in the inflammatory process of the musculus tarsalis superior, first described by Heinrich Müller. This involuntary muscle lies immediately beneath the retro-tarsal conjunctiva, and shares in the inflammation of the latter. As a result, it is more or less paralysed, and the

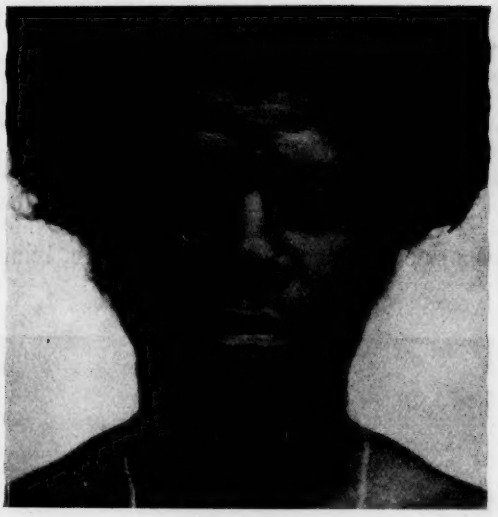

FIG. 3.

Girl aged twenty-three years. Note the slight ptosis more marked on the right, and the thickening of the lower lids.

FIG. 4.

Woman aged about 40 years. Left eye shows scaphoid tarsal plate, thickening of upper and lower lids and pronounced ptosis.

consequence is a drooping of the upper lid. (Fuchs.) The amount of ptosis bears a direct relation to the extent and duration of the disease of the conjunctiva, and is doubtless augmented by the increased weight of the thickened lid (Figs. 4 and 5.)

The less severe forms of the disease resolve, before they have advanced very far, and a thin superficial scar, with little or no pannus, may be all that there is left to show that the disease has been present in the past (Fig. 6.)

Scar tissue first appears in the thickened conjunctiva of the upper lid. There is a special seat of predilection—the middle of the tarsus, 4 or 5 mm. from the free edge of the lid. It is first seen as a smooth shining bluish-white patch, lying below the surface of the surrounding thickened epithelium.

FIG. 5.

Woman aged about 60 years. Note the sinuous margin of the upper lid, and bilateral ptosis. The general infiltration of the cornea can also be made out.

FIG. 6.

Everted upper lid showing homogeneous pink gelatinous surface, in an adult male.

From this nucleus, slender processes of fibrous tissue grow out in a branching manner, which can readily be made out with a magnifying lens. The branching processes unite with each other, and gradually increase in thickness, until the whole width of the tarsal conjunctiva is covered with a network of fibrous tissue. In

FIG. 7.

Male aged 30 years. Dense white scar occupying central portion of tarsal conjunctiva; rough papillae still visible over zone between sulcus subtarsalis and free border of lid, where scar tissue has not yet advanced.

FIG. 8.

Male, aged 35 years. Band of scar tissue occupies central portion of tarsal conjunctiva of right eye.

FIG. 9.

Same patient as in Fig 8; showing scar tissue in left eye. It has advanced to a greater extent in the left eye than in the right—compare Fig. 8.

between the strands of this young scar tissue the much redder conjunctival tissue can be seen protruding slightly above the general surface of the newer and paler network.

The formation of this scar tissue advances from the fornix to the free edge of the lid, so that the upper half of the palpebral conjunctiva may be scarred over and smooth, while the lower half, *i.e.*, the part nearest the free border, is still rough and velvety from the enlarged papillary processes (Fig. 7).

Eventually the whole of the meshwork of scar tissue is filled in by union of adjacent fibrils, resulting in a perfectly smooth shining surface.

Where the scarring has been so deep that it will eventually progress to buckling of the tarsal plate and entropion, a dense white band of scar tissue occupies the central portion of the tarsus. All this scar tissue is highly refractile, and appears white and glistening in photographs (Figs. 7. 8 and 9).

Concurrently with the changes that are taking place in the lids, changes of a similar nature occur in the limbus and cornea, but

FIG. 10.

Female, aged about 40 years. Showing growth of pannus.

owing to the variation in their anatomical features the manifestations of the inflammatory processes are different.

The first obvious naked eye change is the development of pannus (Fig. 10).

As the disease progresses, pannus forms all round the periphery of the cornea, and grows toward the centre. When the pupillary cornea becomes occluded by the new tissue, vision is greatly reduced, and eventually consists merely in the perception of light.

Where the pannus has progressed to such an extent, the cellular infiltration becomes permanently transformed into fibrous tissue. When this has occurred, most of the blood vessels have disappeared, and all that is left is a thin layer of scar tissue—just as in the tarsal conjunctiva—which forms a permanent opaque film incapable of absorption.

Ulceration of the cornea is a very frequent complication amongst the Fijians as a direct result of the pannus, or of the trichiasis which so often follows on the scarring of the lids. Healing of the ulcers leaves permanent opacities, which, according to their density, interfere more or less with the clearness of vision. Such corneal opacities are known to the Fijians by the native name of *seila*.

Sequelae

All degrees of scarring of the lids are met with in the later stages of the disease, when the active infectious processes have yielded to the healing stage which always follows on. In the severer cases, the scarring and subsequent contraction of the conjunctiva and tarsus cause a distortion of the upper lid, which is obvious from the outside (Fig. 4). The lid is seen to have assumed a scaphoid or boat-like shape.

On everting the upper lid, the bend is at once very obvious (Fig. 11).

The most acute angle of curvature occurs along a line corresponding to the sulcus subtarsalis, where the blood vessels pierce

FIG. 11.

Female, aged 36 years. Note the buckling of the tarsal plate, and the acute angle of curvature at the sulcus subtarsalis, where the infiltration of the infectious process, and the subsequent scarring have been greatest.

the tarsus to reach the lower part of the conjunctiva, and where the infiltration of the diseased elements has been greatest.

The distortion of the lids is the result of changes in the conjunctiva and in the tarsal plate itself, both of which are involved in the inflammation, and the subsequent contraction of the scar tissue.

The sharp internal border of the lids becomes altered by the pressure of the eyeball, until it is no longer recognizable with distinctness, but becomes rounded and swollen, and is frequently the seat of blepharitis (Fig. 12). This condition is extremely common amongst the native Fijians.

As a result of the sharp angle which the tarsal plate makes inward, the free border of the lid, with its attached cilia, is brought into contact with the ocular conjunctiva, and with the corneal surface itself, giving rise to entropion. In the more severe cases, the contracting conjunctiva tarsi draws the skin of the lid over

the free border of the latter, and produces the condition of trichiasis (Fig. 13).

In these cases of entropion, on dissecting away the tissue over the tarsal plate during operation, the *crumpled* appearance of the cartilage is very obvious. In addition to the horizontal curvature, there is a series of vertical folds.

FIG. 12.

Destructive changes in lid margins. The sharp internal border of the lid is lost, and is now rounded and swollen.

In the lower lid, both entropion and ectropion occur. The swelling of the fornical conjunctiva of the lower lid pushes the latter away from the globe, and the contraction of the orbicularis muscle produces permanent eversion of the lid.

In old people—aged 60 years or more—the scarring and contraction of the fornical conjunctiva causes a marked diminution in

FIG. 13.

Female, aged about 40 years. Bilateral entropion, thickened upper and lower lids, and widespread corneal opacities. (Note how the cilia lie against the corneal surface.)

the depth of the fornices and in the palpebral aperture, producing the condition of symblepheron posterius.

Where the pannus formation has been very dense, it is not uncommon to find in very old people, the condition of xerophthalmos in which the corneal epithelium has become thick, dry, epidermoid and quite opaque. As a result, the unfortunate person is rendered totally blind.

Constitutional Effects

In addition to the local manifestations of the disease which have been described, there are accompanying effects of a constitutional nature, which are not generally realised.

Thus, in the early stages, when there are present photophobia, lacrymation and slight discharge, the glare of the light is distressing to the sensitive conjunctiva, and there is a natural inclination to remain in the shade. This photophobia frequently amounts to actual pain, and is especially marked in the morning, when the patient first awakes.

Later, the infiltration and thickening of the tissues of the lids causes a diminution in the flow of lymph through the capillaries of the affected tissue, with resulting stasis. The direct effect is a sense of heaviness and drowsiness, which is associated with the typical facies which I have described.

This feeling of inertia is rendered all the more obvious by the extraordinary sense of relief that is obtained when the lids are scarified with the blue stone, or even vigorously rubbed with some hard object, so as to encourage the flow of lymph through the blocked and distended vessels.

When the stage of entropion and pannus, with corneal ulceration, has developed, the unfortunate patient is in a state of constant distress and pain. They may be seen everywhere, going about with their eyes screwed up, and suffering without complaint what they regard as their inevitable lot.

It should not be difficult to believe that such conditions exert a profound effect upon the body generally; and I am convinced that in this disease lies, to a large extent, the cause of the apparent indolence of which the Fijians are so often accused.

APHAKIC STEREOSCOPIC VISION, WITH A NOTE ON THE SYNOPTOPHORE

BY

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AND

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APART from irremediable failure of vision in the first operated eye, the propriety of removing a cataractous lens from the other, is usually decided on the following points.

(1) The condition of the eye itself, whether suitable for operation or not.

(2) The age and activity of the patient, mental and physical. A person of active habit leading a useful life may be suitable at any age, though seldom after seventy-five years of age; the younger of course the better.

(3) Some special demand of the patient's occupation for increased field or perception of depth.

In this class we might include leisured motor-drivers whose left cataract has been removed first, and golfers.

It is essential that the patient should have had stereoscopic vision before the lenses became opaque, and that there should be *no obvious* lesion of the extra-ocular muscles if any stereoscopic vision is to be expected after operation.

Two such cases have been dealt with here (The Royal Westminminster Ophthalmic Hospital) in the last year. One, a sign-writer, *wished the extent of his visual field increased,* and the other, a gardener, had difficulty in judging the distances of seedlings when *"pricking out." Both were satisfied by removal* of the second lens, but unfortunately live at a distance, and could not be tested for inclusion in *this series. Although we cannot find a paper* where stereoscopic vision has been tested in a series of these cases, or one in which the statement *is made, it is occasionally said in conversation* by ophthalmologists that stereoscopic vision is not obtained after double lens extraction.

This statement is not unreasonable, as other elements of depth perception *e.g.*, accommodation are *lost, one eye is in action alone for* a considerable period, and the patients are as a rule old people who readjust themselves but slowly to changes *of this sort.*

Furthermore, the glasses employed introduce another error. With distance glasses of +10 D. and an *interpupillary distance of* 60 mm., a patient in converging from 6 metres for which the glasses

are centred, to 30 cm. (just outside reading distance) is subjected to a prismatic effect equal to 5 prism dioptres of exophoria. This would affect the convergence element of depth perception, but could probably be allowed for by experience.

In order to determine the amount of stereoscopic vision in such cases, the following tests were applied to ten cases of bilateral aphakia.

Tests

(1) Worth's "Four Light Test."
(2) Maddox Rod.
(3) The Synoptophore.

(1) This test in which complementary colours are used to dissociate the images of four lights, demonstrates imperfect fusion or suppression, by allowing the patient to see a larger or smaller number of lights. In the table it is shown whether the patient could overcome the dissociation voluntarily, or whether a prismatic correction was necessary; thus, 5—4 R/L 3Δ. means that five lights were seen by the patient who was able to fuse them to four, after correction of three prism dioptres of right hyperphoria.

(2) The Maddox rod is an additional test of the amount of heterphoria. Apart from its deterrent effect on fusion, Clements has shown that heterophoria alone can disturb the finer degrees of depth perception.

(3) The synoptophore is, so to speak, "the amblyoscope of Worth with a dashboard." The pictures as interpreted by the patient indicate the degree of binocular vision, the corneal reflections the fixation, false or true, while the readings of the instrument show the amount of ocular imbalance. A slight modification of Worth's original terminology is employed, this is based on and similar to, the terminology demonstrated at the Oxford congress by Miss Maddox.

(1) Simultaneous perception I (S.P.). Where the lion is seen beside the cage.

(2) Simultaneous perception II (S.P. 2). Where the lion is in the cage.

(3) Simultaneous macular perception (S.M.P.). Where the bars are seen over the lion without suppression of either. This condition is rarely, if ever, obtained even in adults, the centre of the picture, as a rule, being an unstable compromise between the lion and the cage.

(4) Fusion (F.). Where the two pictures having an object common to both are joined. Since this can be achieved by two eyes, one of which has a "false" (paramacular fixation), one cannot regard these four stages as being strictly in series in a progress towards stereoscopic vision, although they are generally accepted as

Occupation	Interval	Age	L.V.	R.V.	Centering	Maddox Rod	Worth's Lights	Synoptophore	REMARKS
1. Gardener - -	Months 15	31	+14·0=6/9	+13=6/6	Correct	—	5 → 4 with effort	F+3° R 1·5° L	No complaint of diplopia
2. Housework -	19	67	+14·0=6/9 +2·5×180°	+14·0 +1·0×180° =6/9	Correct	—	5 → 4	SP.₂—2·0°, F. 0°, SV. 6/8	Had diplopia at near and in the distance 2/12. Recovered after re-centering of glasses
3. Housework -	4	66	+12·0 +2·75=6/12 ×160°	+14·0= 6/18	R —2 mm. L	R —5 L	5 → 4 R/L 5 Δ	SP.₂ 0° with R/L 6 Δ. Momentary only—no fusion	—
4. Housework -	24	76	+13·5 +2·0×180° =6/9	+13·5 +2·0×120° =6/9	R —1·0 mm. L	R —1 L	4	SP.₂—5°, F. 0°, R L 2Δ, SV. 5/8	—
5. Typist - -	24	23	+14·0 +1·0×180° =6/9	+12·0 +1·0×180° =6/9	L —0·5 mm. R	—	5 → 4	SP.₂ 0°, F.+3°, SV. 6/8	—
6. Labourer - -	30	55	+13·0 +1·0×180° =6/18	+13·0=6/18 +1·0×180°	Correct	No result	—	SP.₂ +5° R L 5Δ F. weak +6°, R L 13 Δ	No diplopia—doubtful if any fusion. Difference in Hyperphoria (?) due to accuracy of patient's impressions

Occupation	Interval	Age	L.V.	R.V.	Centering	Maddox Rod	Worth's Lights	Synoptophore	REMARKS
7. Night Watchman	10	55	$+12\cdot0$ $+2\cdot75\times175^{\circ}$ $=6/9$	$+10\cdot0$ $+2\cdot25\times175^{\circ}$ $=6/12$	Correct	R 10 Δ L. Exo. 8	8	$SP._2$—3°, $\frac{R}{L}$ 14 Δ F. 0°, $\frac{R}{L}$ 12 Δ No SV.	Intractable diplopia with vertical separation, one eye occluded
8. Warehouseman	15	56	$+9\cdot0$ $+2\cdot0\times180^{\circ}$ $=6/6$	$+9\cdot75$ $+1\cdot5\times20^{\circ}$ $=6/6$	R L 2 mm.	—	—	$SP._2$—4° $\frac{R}{L}$ 5 Δ F. 0°, SV. 2/2	Diplopia at 1/12 with reading glasses till recentered
9. Housework	9	62	$+12\cdot0$ $+0\cdot75\times70^{\circ}$ $=6/12$	$+12\cdot0$ $+0\cdot75\times45^{\circ}$ $=6/12$	Correct	R L 1° Eso. 1°	4	$SP._2$ 0°, F. 0°, SV. 6/8	—
10. Housework	25	65	$+12\cdot0$ $+2\cdot5\times180^{\circ}$ $=6/9$	$+11\cdot0$ $+2\cdot0\times180^{\circ}$ $=6/9$	Correct	—	—	$SP._2$—5° $\frac{L}{R}$ 5 Δ, F. 1 +3° $\frac{L}{R}$ 6 Δ	No diplopia

INTERVAL = Interval between capsulotomies. $+3\cdot0^{\circ} = 3^{\circ}$ of convergence. $-3\cdot0^{\circ} = 3^{\circ}$ of divergence.

$\frac{R}{L}$ 5 Δ = 5 Δ of right hyperphoria.

such. In this paper for want of a better classification they are given at their face value. In the table the amount of latent convergence or divergence, and the prismatic correction for hyperphoria are shown thus: —F. −3° R/L 4Δ means that fusion was achieved with the eyes in a position 3° of divergence, after 4 prism dioptres of right hyperphoria had been corrected.

(5) Stereoscopic vision proper (S.V.). The acuity of this is tested by the correctness with which the patient locates the position of eight numbers which appear to be at varying distances from the observer. Where the vision is poor the pictures of two larger objects (a hammer and pincers) are employed, and accuracy is expressed as a fraction *e.g.*, 5/8 or 2/2.

As would be expected hyperphoria was the commonest error to interfere with fusion, and in three cases it was directly related to poor centering of the glasses.

No paralysis of extra-ocular muscles was observed in any case. It is sometimes stated that the interval between the operations on the two eyes has a bearing on the degree of stereoscopic vision developed. In this series there appears to be no such relationship. The interval between the restoration of vision to the two eyes is given in months in the table. Another point of interest is that although normal eyes are slightly less convergent as a rule in the tests for fusion than in the tests for simultaneous perception, in these aphakic eyes the opposite condition obtains, although accommodation is necessarily absent.

Results

Out of ten cases:—

Three, Nos. 2, 5 and 9 had good stereoscopic vision.

Two, Nos. 4 and 8 had good stereoscopic vision with prisms.

Three, Nos. 1, 6 and 10 had fusion with prisms.

One, No. 3 had simultaneous perception with prisms.

One, No. 7 had intractable diplopia.

All these patients were carrying on useful if unaggressive lives, and none except No. 7, who had one eye permanently occluded had the least difficulty in pouring themselves a drink without spilling it.

Simple though this feat sounds, it is quite difficult to perform, after losing the stereoscopic vision on which one has formerly relied, as can be noticed in young workmen who have lost an eye in an accident. It is assumed, of course, that the method employed is not that used by Stagg the blind man in "Barnaby Rudge."

The conclusion would seem to be, that if glasses are fitted with sufficient care, it is worth while removing a second cataract to try and obtain stereoscopic vision, if such would assist a patient in his or her mode of living.

Our thanks are due to the Surgeons of this hospital for permission to publish these cases.

ANNOTATION

Reading with Closed Eyes

An important, and so far as we are aware, novel series of observations is contributed to the Canadian Medical Association Journal, of November, 1932, by A. H. Pirie, B.Sc., M.D., of Montreal, under the above title.

The point is that print or pictures can be seen with closed eyes when the eyes are properly prepared to receive the appropriate stimulus. This occurs when the X-rays are used. The method is simple. The observer must remain in total darkness for at least ten minutes. At the end of that time he will be able to see light when the X-rays strike his eyelids. After twenty minutes in the dark he will be able to read printed letters and to see pictures with the technique described below. A crystalline lens in the eye is not essential, for an aphakic patient was able to see and read as clearly as any other of the cases tested whose lenses were still *in situ*. When the aphakic patient tried to read the letters with his spectacles on, fluorescence occurred and vitiated the result. All glass fluoresces and Pirie draws the extremely practical conclusion that the method he describes may be of great service in cases of injury where minute fragments of glass are embedded in the deeper parts of the eye. Such bits may throw very little shadow on a photographic film and yet might fluoresce under the X-rays sufficiently for the surgeon to see them. Simple diagrams show the method in use. The X-ray tube sends rays to the retina and in their path a lead letter "T" is placed touching the closed lids. The retina sees light except where the shadow of the "T" protects it from the rays. This shadow of the "T" is upright on the retina and not reversed; the brain receives the message contrary to what it experiences by ordinary vision. Stereoscopic vision can be obtained by presenting stereoscopic pictures pricked in a lead treatment sheet to each eye and moving them about till the effects fuse. Metallic foreign bodies can be made to cast their shadows on the retina. The patient must be kept in total darkness for twenty minutes. If the foreign body has already been exactly localized, the patient will localize it in the same position, but turned from right to left and from above down.

If, therefore, the foreign body be localized in the lower nasal quadrant the patient will see it in the upper temporal quadrant. A brass grid with a central cross and two circles placed in front of the eye helps to make the localization more exact. When a foreign body lies inside the eye it only casts one shadow and the patient sees it as single; when it lies outside the eye it may cast one or

two shadows; if the patient sees it double it is a proof that the foreign body lies outside the globe. (This assumes that not more than one foreign body is present in the globe.) A damaged area in the retina is recognized by the patient as a black spot. The blind spot can only be recognized by using weak X-rays; with rays of the ordinary strength its presence is lost in the brilliant field of illumination just as the stars are invisible when the sun is overhead.

The field of vision can be mapped out by using the grid; and this obtains in cases with dense opacity in the media.

When a solid spinning-wheel provided with a single hole is looked at by this method the individual flashes of the X-ray tube can be seen, but the impression gained is that the wheel is rotating in a direction opposite to its real motion.

There would appear to be a distinct field of usefulness in ophthalmology for this addition to our armamentarium.

INTERNATIONAL OPHTHALMOLOGICAL CONGRESS

Madrid, April 16-22, 1933

THE National Committee of the International Ophthalmological Congress at Madrid have hired the Palace Hotel in which all the official meetings will take place. The Management of the Hotel are giving special terms to members of the Congress; single rooms, with private bath-room, from 22 ptas. for an inside room to 35 ptas. for an outside room. Double rooms from 32 to 60 ptas. The meals will come to a total of 25 ptas. with 10 per cent. for service added to these rates. The present value of the peseta is 41 to the £. We understand that numerous reservations have already been made.

The first-class return fare to Madrid by Paris and Irun is 17 guineas, and for second-class £13 5s. 11d. In addition, there will be the cost of reservation of seats in the pullman or in the Golden Arrow, and the price of sleeping-berths—first-class Paris to Irun £3 7s. 2d.; second-class £2 11s. 4d. The total cost, therefore of the first-class return ticket with sleeping berths will be approximately £27 and of the second-class return ticket £20. Arrangements are, however, being made to secure special reduction of these rates on production of vouchers. The amount of this reduction has not yet been definitely ascertained, but the Southern Railway and probably the other British railways will reduce their return fare to approximately a fare and a third, on production of a voucher, and the French and Spanish railways have agreed to a reduction of 40 per cent. It is not yet certain whether that reduction will be available by the trains de luxe.

In many cases, the reduction only applies on the French railways to the ordinary trains and not to the trains de luxe. The best service leaves London at 11 a.m., but there may be some alterations in the times after April 5. The connection leaves Paris (Quai d'Orsay) at 8.40 p.m., reaching Irun at 9.15 a.m., and Madrid at 8 p.m. on the evening of the second day, if travelling by the Golden Arrow and the Côte d'Argent from Paris. Sleeping cars are available from Paris to Irun.

Intending members who have not yet entered their names are requested to do so at the earliest possible opportunity to Dr. F. Poyales, Olózaga 3, Madrid.

Since writing the above, Mr. Leslie Paton has received the following letter from the Continental Traffic Manager of the Southern Railway, which he asks us to insert:—

"With reference to your letter of the 12 inst., I have been in communication with Madrid regarding the International Ophthalmological Congress, and we are hoping to concentrate any traffic from Great Britain into a party and so take advantage of the maximum reductions available over the various Railway Administrations.

Mr. Bosch, Manager of the Spanish Tourist Service of Messrs. Pickfords, Ltd., has taken the matter specially in hand with a view to centralizing the traffic, and, at present, the proposal is that a party should leave London on either Wednesday, Thursday or Friday, April 12, 13 or 14, for Madrid, travelling from Victoria by the 9 a.m. service via Folkestone-Boulogne, connecting in Paris with the train leaving the Quai d'Orsay at 19.22.

From the Provinces to London, tickets at the single fare and one-half for the return journey, available 30 days, will be issued to those holding the tickets from London to the Continent."

ABSTRACTS

I.—OPTICS AND REFRACTION

(1) **Ames, A., Gliddon, Gordon H., and Ogle, Kenneth N. (Hanover).—Size and shape of ocular images. (1) Methods of determination and physiologic significance.** *Arch. of Ophthal.*, April, 1932.

(1) These papers deal with a subject which may have an important bearing on cases of otherwise inexplicable asthenopia. If there be a difference in the size and/or shape of the ocular images in the two eyes, discomfort may result. Such a difference may be

brought about if (*a*) the nodal point in one eye is nearer the retina than in the other, or (*b*) the arrangement of the retinal elements in the two eyes is not the same—*e.g.*, if the separation of the retinal elements in the right eye is greater than in the left, objects will appear smaller to it. These differences in size may be symmetrical or asymmetrical, the latter being somewhaf complicated; *e.g.*, the image in the one eye may be progressively larger in the right field, and progressively smaller in the left field, an effect which can be produced by looking through an ordinary flat prism, though some distortion of this sort is normally present (the Hering-Hillebrand horopter deviation) the image on the nasal side of the field being smaller than that on the temporal. In the ordinary way, these differences in size are not noticed, since although the images do not fall on corresponding retinal points, they fall within corresponding fusional areas (Panum's areas) and so are fused and appear single. To demonstrate irregularity, it is therefore necessary to present dissimilar images to the two eyes. This can be done with an instrument resembling an amblyoscope, and gives results accurate to 0.5 per cent. in practically all patients, and to 0.25 per cent. in a great many, *i.e.*, an increase in size of 0.25 per cent. is appreciated. Special lenses have been prepared by the American Optical Company of zero power, which magnify the size of the image, one type altering the size over all, while the other alters it only meridionally. By using these so as to make the two images appear equal, it is possible to tell the relative difference in size. An alternative plan is to have an instrument in which the actual objects themselves are variable, and this has also been done by an apparatus known as the grid nonius device, in which a series of wires is used, one set for the right eye and one for the left, the images presented to the two eyes being rendered dissimilar by a grid-like screen. The effect of a disparity in size of the two ocular images is to change the apparent position of one object in space. The simplest form of this is an apparent horizontal rotation of the visual field around a vertical axis at the point of fixation when there is disparity in size or shape of the ocular images in a horizontal direction. Various changes occur during the physiological activities of the eyes; thus accommodation of 2.5 D. moves the nodal point of the eye away from the retina by an amount sufficient to cause 1 per cent. increase in size of the retinal image. As evidence of the clinical importance of disparity in size of retinal images, wearing of a lens before one eye which caused a 1.5 per cent. increase in size produced a marked headache in about an hour, also in 16 normal persons, 6 showed no size difference in the two eyes, and the average for the remaining 10 was 0.85 per cent. The size differences found in 96 "clinical cases" averaged 1.54 per cent.

F. A. W-N.

(2) **Carleton, Elmer H., and Madigan, Leo. F. (Hanover).—Size and shape of ocular images.** *Arch. of Ophthal.*, May, 1932.

(2) **Carleton** and **Madigan** examined and treated a series of 96 patients who presented eye symptoms, unrelieved by ordinary glasses and correction of phorias. Differences between the size of the ocular images were found and were corrected by special lenses with complete relief of symptoms in 20 per cent. of cases, partial relief in 60 per cent., and no relief in 20 per cent. Symptoms associated with size differences were of two types (1) General, *e.g.*, headache, stomach disorder (2) Ocular, *e.g.*, photophobia, suppression, tiring or burning of the eyes, and inability to use them for any length of time. The authors' findings have some bearing on the correction of anisometropia since the change of size produced by a $\pm$ 2 D. lens is about 4 per cent., which amount represents the limit in difference of size which can be tolerated. The comparatively large proportion of failures is explained by the fact that so far, only the fringe of the subject has been touched, *e.g.*, symmetrical size differences over all, or in one meridian were the only types it was possible to correct, whereas they represent but one type of difference in the size and shape of the ocular images.

F. A. W-N.

(3) **White, James Watson (New York).—Hyperphoria.** *Arch. of Ophthal.*, May, 1932.

(3) The moral of **White's** paper is given—as it should be—in the concluding sentence. "Most important of all is to study well the corners in all cases of hyperphoria." By this, the author means that hyperphoria should be measured not only in the straightforward direction of the gaze, but also in oblique positions. If measurements are made in the nine cardinal directions, many cases of apparent hyperphoria will turn out to be due to a paresis; in the author's practice, as many as 98 per cent. The majority are due to weakness of the superior or inferior rectus, the superior or inferior oblique being much less frequently involved. The paresis is usually complicated by some secondary contraction of the direct antagonist. So called "double hyperphoria" is due to paresis, more or less marked of the same muscle in each eye. These are found in the following order of frequency, superior recti, inferior recti, inferior obliques. Exophoria and esophoria may be the result of hyperphoria, and become reduced in amount when the latter is corrected. For this reason, in operating if there is any hyperphoria it is better to attack the vertical muscles, before doing any operation on the horizontal pair. It is not always advisable to operate on the affected muscle, and tenotomy of the associate antagonist may give a better result, *e.g.*, tenotomy of the right inferior oblique in a case of paralysis of the left superior rectus.

F. A. W-N.

(4) **de H. Prangen, Avery (Rochester, Minn.). — Subnormal accommodation.** *Arch. of Ophthal.*, December, 1931.

(4) **Prangen's** paper opens with a review of the literature of this condition and a recommendation by Edward Jackson that the taking of the near point should be as much a part of the routine examination as the use of distant test letters and trial lenses. Theobald on the other hand is quoted as saying that subnormal accommodative power is best evidenced by exophoria of less than 5 degrees in near vision. He found a 10 per cent. incidence of this condition among refraction cases, though Duane puts it at 5 per cent. The latter quotes a number of aetiological factors, such as anaemia, eyestrain, neurasthenia, intestinal toxaemia and focal sepsis. Woods has found the converse condition in which spasticity of the ciliary muscle would not relax under any cycloplegic, until the removal of infected teeth. The author presents in his paper a series of 20 cases of subnormal accommodation and divides them into two classes (1) Static or premature presbyopia and (2) Dynamic where the defect is innervational. Patients of the first group are made comfortable by the addition of a reading correction according to the amount of accommodative insufficiency. In the second group—apart from cases of internal ophthalmoplegia in which the defect is unilateral—the majority showed apical infection of the teeth and accommodation became normal after the condition had been dealt with. Tonsillar infection was a less common cause, hypothyroidism was present in one case and an artificial menopause was noted in another. The author is of opinion that there is a close relationship between subnormal accommodation and spasm of the ciliary muscle.

F. A. W-N.

(5) **Luedde, W. H. (Saint Louis).—Monocular cycloplegia for the control of Myopia.** *Amer. Jl. of Ophthal.*, July, 1932.

(5) **Luedde** was led to use this method by the suggestion of Donders that watchmakers were relatively exempt from myopia because they used a monocular loupe in their work, and thus avoided excessive convergence. 1 per cent. atropine is dropped into one eye, twice a week for periods of varying length. If the cycloplegia is to be continued for longer than a few weeks, it is customary to change from one eye to the other. Up-to-date, Luedde has used this method of treatment in about 30 patients, and in every case it had checked the advance of myopia during the period in which it was used. The theory underlying its use is that during convergence the eyes are compressed by the stretched external recti and possibly by the obliques, so that those sclerotics which are predisposed to distension will become expanded. If convergence is abolished, this compression disappears. The author does not state whether

convergence occurred in patients with monocular cycloplegia, but this is a matter which could easily be determined, and the method of treatment is so simple that it would appear to be well worth trying.

F. A. W-N.

II.—PATHOLOGY AND BACTERIOLOGY

(1) **Samuels, Bernard (New York).—Some notes on orbital tumours.** *Arch. of Ophthal.*, June, 1932.

(1) Much has been written about the morphology of orbital tumours and **Samuels** in this paper, concerns himself more with the manner in which the pre-existing orbital structures react to the presence of a neoplasm. Carcinoma cells in their metabolism produce an intensely irritating toxin which brings about lymphocytic infiltration of the adjoining tissues with the result that bands of connective tissue are formed which impede the growth of the tumour. These bands, by their contraction, may draw the eyeball to one side and fix it to the wall of the orbit. Cylindromas usually derived from the lacrymal gland and resembling basal celled carcinoma, are not so irritating though there may be a good deal of fibrosis associated with these also. Glaucoma may occur in these cases, as a result of interference with venous outflow. Sarcoma, in contrast to carcinoma, produces few signs of inflammation in the surrounding tissue. Though definitely malignant, this tumour often appears to have a capsule. The growth may indent the sclera without perforating it and so may bring about an intra-ocular appearance simulating retinal detachment. Haemangiomata are rare in the orbit but dangerous because of their tendency to enlarge and to cause pressure atrophy of the orbital contents and even of the bony wall. Neurofibromatosis, especially in the apex of the orbit may bring about early reduction of vision by pressure on the optic nerve. A contrast is afforded by glioma of the optic nerve in which vision may be preserved for an indefinite time. The absence of pain in most neoplasms of the orbit, is probably due to the easy displacement forward of the eye. Intra-ocular sarcoma provides a contrast to carcinoma in that the irritation it produces is due to a toxin developed as a result of necrosis of its constituent cells whereas in carcinoma the toxin is produced by the living cells. Purulent necrosis of the sclera may occur beneath a choroidal sarcoma and allow of its extension to the orbit. Samuels' article concludes with a short account of the difficulties in diagnosis of inflammatory pseudo-tumour of the orbit and a warning against exenteration being performed without excluding a syphilitic or other inflammatory cause for the proptosis.

F. A. W-N.

(2) **Meller, J.** (Vienna).—**The demonstration of tubercle bacilli in uveitis by culture from the ocular tissue.** (**Nachweiss von Tuberkelbacillen bei Uveitis durch Kultur aus dem Gewebe des Augeninnern.**

Urbanek, J., and Meller, R. (Vienna).—**The demonstration of tubercle bacilli in the blood of patients with eye disease.** (**Tuberkelbacillennachweis im Blute augenkranker Menschen**). *Zeitschr. f. Augenheilk.*, Bd. 77, S. 1 and 17 respectively, 1932.

(2) **Meller** reports the case of a man aged 23 years, whose left eye was shrunken from old apparently healed iridocyclitis, and whose right eye also showed evidence of inflammation. There was no evidence of tuberculosis elsewhere, but treatment with *Tebeprotein* produced injection in both eyes, and the left had to be excised. Section revealed small round-celled infiltration in the ciliary body and choroid, as also tubercles without necrosis or caseation in the choroid. As bacilli could not be detected by the ordinary staining methods, Löwenstein, by his method of tissue culture, showed such to be present, apparently the organisms embedded in the epithelial cells undergo changes which interfere with staining reactions.

Urbanek and **Meller** report over 500 cases of uveitis, scleritis and allied conditions. Focal sepsis could but rarely be established, so that tuberculosis had to be assumed, though this was difficult to prove clinically because ocular lesions are so frequently present in mild cases of tuberculosis elsewhere. The blood of 70 patients was examined for tubercle bacilli and additional evidence was sought from guinea-pig inoculation. Only in one case were bacilli found in the blood; in three cases the guinea-pigs developed generalised tuberculosis, and in four more, the animals showed a specific tuberculin reaction. Incidentally the authors stress the value of *Tebeprotein* in the treatment of such lesions.

ARNOLD SORSBY.

(3) **Edmund, C.** (Copenhagen).—**The gonococcal complement fixation reaction in gonorrhoeal iridocyclitis.** (**Die Gonokokkenkomplementbindungsreaktion und Iridocyclitis Gonorrhoica**). *Acta Ophthal.*, Vol. X, p. 151, 1932.

(3) **Edmund** reports five cases of iritis, seven of iridocyclitis and two of choroiditis in which the gonococcal complement fixation was positive, and thus helped to decide the line of treatment—a point of all the greater significance as clinically these cases did not present any characteristic features by which their causation could be determined. Stress is laid on the two cases of choroiditis, one of which also showed retinal involvement and affection of both eyes. The tests were carried out by the Kristensen-Kristjansen method.

ARNOLD SORSBY.

BOOK NOTICES

The Disturbances of Mobility of the Eyes. By A. BIELSCHOWSKY. (*Die Motilitätsstörungen* der Augen) Graefe-Saemisch Handbuch der Augenheilkunde. lfg. 498-501, 1932.

This is a continuation of the section of the "*handbook*" on this subject, which was published several years ago, and begins with the retraction phenomena in certain forms of paralyses of the eye muscles. The part now published runs to over 300 pages and contains a full description of all the forms of muscular paralysis enriched by copious case reports.

A curious feature upon which the author remarks is the increase in the number of cases of paralysis of the superior oblique and this he ascribes to the operation for the radical cure of frontal sinus disease, in which the periosteum and with it the trochlea, is raised off the bone and is not always carefully replaced in its original position.

On the other hand, there has been a marked decrease in recent years of the paralyses due to syphilis and metasyphilis (from 40 per cent. to 26 per cent. of all cases of paralysis).

There is a very valuable chapter on the operative treatment of paralytic squints, dealing with all the possible forms, and illustrated by many photographs of patients before and after operation.

The book forms a masterly exposition of the whole subject and is expressed in clear-cut and precise German. There is a welcome absence of the long and complicated sentences so beloved of some German writers, with the result that it is a relatively easy book for the foreigner to read and understand.

Augenheilkunde des praktischen Artzes. By K. VOGELSANG. Pp. VI + 121. Berlin and Vienna: Urban and Schwarzenberg. 1933. Price, R.M., 4.00.

Based on a series of articles in the *Medizinische Klinik*, this little book on ophthalmology for general practitioners and students, has a distinct individuality of its own. It does not aim at comprehensiveness and the style is pleasantly discursive. It is thoroughly modern in outlook, so much so, that a whole chapter is devoted to heredity in ophthalmology. Unlike most German publications, it is aware of focal sepsis, though such an anachronism as rheumatic iritis still finds a place. The chapters on correlation of eye and central nervous system are particularly well done; indeed throughout the book the connecting links between ophthalmology and general medicine are well brought out.

Primera Reunion Latino-Americana de Oftalmologia.

The report of the first Ophthalmological Congress embracing the Latin-American peoples of South America which was held at Santiago-di-Chile in February, 1931, shows very definitely that no inconsiderable interest is taken in ophthalmology in this Continent, and that the clinical work done there is of high standing. The report itself is a large volume of over 700 pages and embraces a wide range of papers. Eleven of these deal with clinical conditions of various kinds. A further six papers deal with surgical subjects, two of which are on intra-capsular methods of extraction of the lens, two on the newer methods of operating for detachment of the retina, and one on the place of cyclo-dialysis in the treatment of glaucoma. Six papers were contributed on the purely therapeutic aspects of ophthalmology, including the value of diathermy, radio-therapy, and tuberculin in the treatment of ocular diseases. Seven papers deal with medical ophthalmology and nine with neurology, and a considerable number are devoted to diseases of the lacrimal sac, with special reference to its treatment by various types of drainage operations into the nose. The volume also gives a resumé of the social aspects of the Congress, and contains photographs of the more prominent ophthalmologists who took part in it.

OBITUARY*

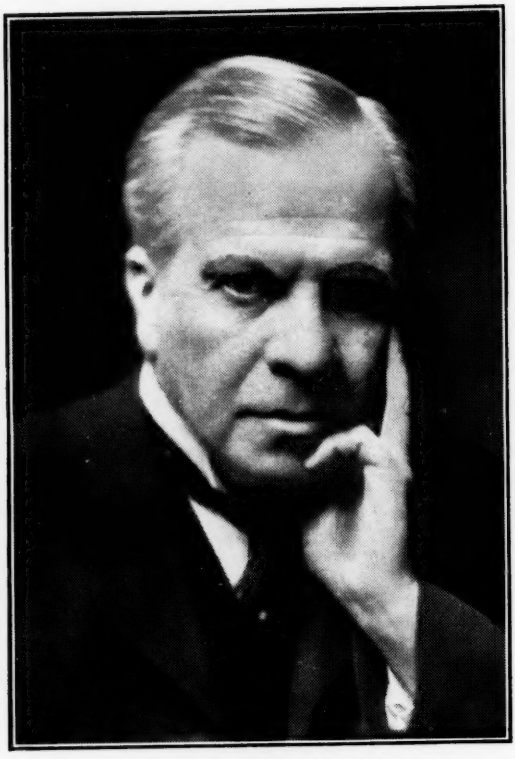
E. TREACHER COLLINS

THE death of Mr. Treacher Collins, which took place on Tuesday, December 13, has deprived the world of English Ophthalmology of one of its principal leaders. Very early in his career he attained an established position and in recent years he came to be regarded as the doyen of British Ophthalmologists. Throughout his life a careful and skilful observer he did much to establish the very high reputation of British Ophthalmology in the scientific world.

Edward Treacher Collins was the son of Dr. W. J. Collins, of London, and his mother, a daughter of Mr. Edouard Treacher, came of an old Huguenot stock. His elder brother, Sir William Job Collins, well-known as an ophthalmic surgeon, and as a former chairman of the London County Council and for some years a Liberal M.P., has served the country well in many public offices.

Treacher Collins was educated at University College School

*This memoir is based, by permission, upon that contributed to the *British Medical Journal* for December 24, 1932. We are indebted to the same Journal for the block for illustration.



E. TREACHER COLLINS

which in his schooldays still occupied premises behind the present University College. He and Ernest Clarke, whose obituary appeared in our last number, were at school together, though Clarke was by some years the senior. He qualified from the Middlesex Hospital in 1883 and very soon turned his attention to Ophthalmology, being House Surgeon at Moorfields from 1884 to 1887. It was the work done in the following seven years—1887 to 1894—as Curator and Pathologist to the Royal London Ophthalmic Hospital (Moorfields) which laid the foundations of his extensive and accurate knowledge of ophthalmology and established his reputation as a scientific worker. His first paper in the Moorfields Hospital Reports appeared in 1887 on anophthalmos, and his contributions to the Ophthalmological Society's Transactions began in a modest way in 1888. (He had been elected a member in 1885.) He became a Fellow of the Royal College of Surgeons in 1890.

The results of his ten years apprenticeship at Moorfields were summarized in the Hunterian Lectures which he gave to the Royal College of Surgeons in 1894 and in these lectures will be found the germ of much work which he subsequently elaborated. The lectures, revised and enlarged, were published in book form in 1896 under the title of "Researches into the Anatomy and Pathology of the Eye." It was this work which gained for him the Middlemore Prize of the British Medical Association. But probably what Collins valued more than anything else was, that it was his period of office as Curator that established the reputation of Moorfields as a leading school of research and education in the Eye world and many ophthalmologists of note in Great Britain, America, and elsewhere, look back with affectionate regard to the work they did under Collins's guidance in the Moorfields' laboratory.

In 1894, Mr. George Lawson, Surgeon Oculist to Queen Victoria, was asked to nominate an Ophthalmic Surgeon to go to Persia to operate on the Shah's eldest son, and Collins was selected. He married before his departure and spent his honeymoon in Persia. On his return, he wrote an account of his experiences there under the title "In the Kingdom of the Shah." He was rewarded for his services with the Order of the Lion and the Sun. Among other results of his experiences was a keen interest in and an extensive knowledge of Persian art, especially carpets and faience. On his return in 1895, he was elected to the Staff of the Royal London Ophthalmic Hospital as Assistant Surgeon. From the time of his appointment as House Surgeon till his death, when he was a Consulting Surgeon and a member of the Committee of Management of the Hospital, a period of 48 years elapsed.

During the five years following his return from Persia, despite the increasing claims of clinical work on his time, he continued his anatomical and pathological researches, and again the work of these five years was partially summarised in the Erasmus Wilson lectures delivered at the Royal College of Surgeons in February, 1900 on the Anatomy and Pathology of the Eye.

About this time, the question of the removal of the Hospital from its old site in Moorfields to City Road was under consideration and Collins, as Secretary of the Medical Board, had much to do with the consequent arrangements.

A short list of his hospital appointments will serve to show the amount of purely clinical work that he did. In addition to his Moorfields Surgeoncy, he was Ophthalmic Surgeon to Charing Cross Hospital and to the Belgrave Hospital for Children, Visiting Ophthalmic Surgeon to the Metropolitan Asylums Board Ophthalmia Schools at Swanley, Consulting Surgeon to the Westminster Ophthalmic Hospital and to the Oxford Eye Hospital. He was also Lecturer on Ophthalmology to Charing Cross Hospital, at the London School of Tropical Medicine and to the Oxford University Post Graduate School of Ophthalmology. He was Secretary of the Ophthalmological Society from 1898 to 1901, having previously served on the Council, and became a Vice-President for the first time in 1905. In 1915 he was awarded the Nettleship Medal (given for the most distinguished scientific work in Ophthalmology done in the preceding three years), and in 1917 he was elected to the Presidency. During his Presidency the formation of the Council of British Ophthalmologists was first mooted and he took a leading part in the founding of this body which has played such an important part in what may be called the State and Public relations of Ophthalmic Science. A few years later he became President of the Council and occupied this position for three years. In 1921 he was asked to give the Bowman Lecture, the highest honour that can be conferred by British Oculists, and, characteristically, he chose a purely scientific subject for his lecture—"Changes in the visual organs correlated with the adoption of arboreal life and the assumption of the erect posture." The lecture illustrated fully the breadth of his scientific knowledge and amount of painstaking research which he put into all his work. "The Times," in its obituary notice, calls it "an instructive and not too technical account of the influence of environment on the adaptation of the organs of sight in the struggle for existence. Its scope is much wider than is indicated by the title."

Collins was the official representative for the British Government at the American Ophthalmological Congress in 1922. Shortly after his return from America, negotiations for the resumption of the Internation Congresses, such as had been held at four year

intervals before the war, were begun. It was soon found that the difficulties in the way of the resumption of the normal Congresses were too great and, in place of an International Congress, a Convention of English-speaking Ophthalmologists was held in London in 1925. For that occasion, Collins, for the second time, became President of the Ophthalmological Society and much of the success of the Convention was due to the gracious way in which he conducted the business of the meeting. Few who were present at the Banquet in the Guildhall, when the Duke of Connaught was the Guest of Honour, will forget the charm and grace of the Chairman's speech. It was during that meeting that Collins was asked to select a small committee of five to try to arrange for a true International Congress. Only the few who formed that committee can know the amount of work that he did to ensure its success. As a result of its work and of the most valuable co-operation of Professor van der Hoeve, a meeting was held at Scheveningen in 1927 attended by 50 delegates representing 25 different nationalities, and, though Collins's small committee looked forward with some trepidation to the meeting, nothing could have gone more smoothly. At the conclusion of the meeting at Scheveningen, when the International Council of Ophthalmologists was formed, Collins was elected by universal acclamation Honorary President of the Council, and so took his place beside Bowman, von Graefe, Donders and Fuchs as a leader in International Ophthalmology.

In 1931 he was awarded the Mackenzie Medal and took as the subject of his address "The Physiology of Weeping." This was published in our columns last year.

He was an Honorary Member of the American Medical Association, of the Copenhagen Medical Society, the Egyptian Ophthalmological Society and the Hungarian Ophthalmological Society.

It is impossible to ennumerate here all the contributions of Treacher Collins to the literature of Ophthalmology. There are over 100 original papers of varying size in the Transactions of the Ophthalmological Society alone, apart from innumerable contributions to discussions, and very frequently Collins's remarks in a discussion were of much greater value than the paper that gave rise to them. In the Moorfields Reports, there are more than 20 papers of value. Others appeared in the Transactions of the Section of Ophthalmology of the Royal Society of Medicine, in the British Medical Journal and in the Lancet. Together with Mayou, he published the well-known book on "The Pathology of the Eye" which has recently gone into a second edition, and in 1929 he published "The History and Traditions of the Moorfields Eye Hospital."

Even after the illness, which was to prove fatal, attacked him, he was still able to show his keenness for anything which would advance the interests of the subject of his life's work and he drew up and sent to the present writer notes and a draft of regulations for the formation of an International Federation of Ophthalmological Societes which will come up for discussion at the forthcoming International Congress at Madrid. And, even when he was obviously failing, he insisted on having the papers and letters brought out and read to him.

Whatever he undertook, whether it were of scientific interest or to further the more general interests of Ophthalmology, he did with his whole heart. His two greatest interests were the Royal London Ophthalmic Hospital and the Ophthalmological Society. For these he worked all his life and of these he thought as he lay dying. How dear the interests of the Ophthalmological Society were to him was shown by a letter to a junior after the latter had completed a term of office in the Society. It was a very gracious thing for an old and honoured President to take the trouble to write and thank a younger officer for the work he had done in the interests of the Society, and it threw a strong light on his affection for the Society and his keen interest in its prosperity. He was absolutely zealous in his pursuit of any scheme which would help to advance the Science and Art of Ophthalmology. He was without any envious thought, always willing to do anything to help a colleague. His heart harboured no mean thought. It is little wonder that there was awakened a strong feeling of affectionate admiration on the part of all those who were, in any way, brought into intimate association with him. Though he had no gift of languages he was immensely popular with all his foreign colleagues and when he rose to speak at a great International Meeting at Scheveningen, he was received with prolonged acclamation. He had a very pretty wit in after-dinner speaking. There was a graciousness and a quiet humour about the short speeches which he was so frequently called on to make at ophthalmic gatherings. He always seemed to be able to strike the right note and if a story were introduced it seemed always fitting to the occasion. "The Times" says of him that "he was a painstaking and skilled observer, who wrote well and clearly about the facts he had obtained by experiment and extended clinical research. A sound teacher, a skilful operator, a loyal colleague and a faithful friend."

His death leaves a gap among the workers in the Science of Ophthalmology which only very few can fill, and a wound in the hearts of many of us who were his friends of which the scar will always remain.

L. P.

Mr. J. B. Lawford writes:—

Deeply as I lament the necessity, I welcome the opportunity of offering my tribute of admiration to the life and work of Treacher Collins, and an expression of my sincere regard and esteem for him. It is perhaps the more fitting that I should do so, as I believe it is correct to say that no one was more closely associated with him in his early days at Moorfields. We both held junior posts at the hospital, and for several years were in daily contact, while a little later we undertook some lengthy investigations together. Thus I became thoroughly cognisant of his industry, his quiet persistence, and his powers of concentration and critical observation, characteristics which were even more prominent in the later stages of his career and, without doubt, proved a valuable asset in his scientific work.

Again, many years later we were closely associated as joint secretaries of the Ophthalmological Section of the International Medical Congress held in London in 1913. I have not forgotten how greatly his energy and foresight and his cheery co-operation helped in a rather formidable task.

Collins was the happy possessor of an exceptional memory for clinical and pathological details, and frequently excited my admiration by his ability to recall the features of cases or specimens examined years before. In this respect he resembled two former Moorfields surgeons, Jonathan Hutchinson and Nettleship.

His death has ended a valued friendship of nearly half a century —it has been my good fortune to share it.

Dr. John Rowan writes:—

I am in receipt of the *"British Journal of Ophthalmology"* and from it I see you hope to publish a memoir of the late Mr. E. Treacher Collins in your next number.

As I had the pleasure of travelling with him to America, to the Congress in Washington in 1922, I should like to say what an agreeable companion he was. I have travelled with him on a number of occasions, and have always found him the same. At the Congress in America, both Americans and Canadians remarked what a leading position he held in Ophthalmology. He took part in a friendly and informal way, in many of the discussions, and was always listened to with the greatest respect, and his opinion carried great weight.

What struck me there especially, was the number of men who came up and spoke to him, and the affection and respect they obviously had for him. Man after man came up at different times, and said "Do you remember me Mr. Collins? I was at Moorfields

on such and such a date." I was struck with Collins' memory, he, of course, frankly admitted he could not name them all, but it seemed to me there was hardly a man, who spoke to him that he did not know by head mark.

THE chief contributions of Mr. Treacher Collins to English Ophthalmic periodicals are summarised below.

Ophthalmic Hospital Reports.

1887 VOL. XI.
Notes on in-patients.
Anophthalmos.

1888 VOL. XII.
P. 19. Complications after cataract extraction.
P. 164. Atropine irritation.
P. 179. *Treatment of suppuration after cataract extraction.*
P. 273. Primary sarcoma of iris.
1889 P. 281. With Cyril Walker—Orbit. cellul. etc., accompanied by cerebral abscess.
P. 334. Curator's notes.

1890 VOL. XIII.
P. 12. With Lawford—glioma retinae.
P. 41. *Intra-ocular cysts.*
P. 81. Develop. of abnormalities in Zon. of Zinn.
1891 P. 104. With Lawford—sarcoma of uveal tract.
P. 248. Tumours in each orbit.
1893 P. 395. With Lawford—Sarcoma of lacrymal gland. Curator's reports. Catalogue of Museum spec.

1895 VOL. XIV.
Catalogue of Museum spec.—continued.
1896 P. 303. Develop. of post. elastic lamina. Memb. of Descemet.
P. 374. Perm. cent. scotoma, caused by looking at sun.

1899 VOL. XV.
P 31. Elastic tissues of eyeball.
1903 P. 206. Children of patients who have had interstitial keratitis.

1904 VOL. XVI.
P. 16. Prim. Chancre of Conj. and interstitial keratitis.
1905 P. 123. Devel. of accom. power of human lens.
P. 247. Capsular complications after cataract extraction.

1910 VOL. XVIII.
P. 1. Diseases of lymph. tiss. of the conjunctiva.

Ophthalmological Society of the United Kingdom.

1888 VOL. VIII.
P. 177. Case—card spec.—diseases of the choroid.

1889 VOL. IX.
Pp. 198-200. Microscop. sections of neoplasm situated between choroid and retina, exhibiting structural peculiarities.

1890 VOL. X.

P. 62-64. Cases—micros. appearances of cornea in two eyes lost from *xerosis or essential shrinking of conj.*

Pp. 108-136. Glaucoma after extrn. of cataract.

Pp. 145-147. Lens with epithelium on post. capsule and other peculiar structural changes. *Case.*

1891 VOL. XI.

Pp. 43-47. Two cases of staining of the cornea by blood pigment.

Pp. 55-63. Glands of the ciliary body in the human eye.

P. 126. *Extensive rupture of the post. capsule of lens following blow on the eye from a stone.*

Pp. 133-136. A large epithel. implantation cyst in shrunken globe, 28 years after receipt of injury.

1892 VOL. XII.

Pp. 64-67. Epithel. implantation cyst of cornea.

Pp. 89-105. On the minute anatomy of pyramidal cataract.

Pp. 165-167. *Intra-ocular neopl. of doutful nature and origin.*

Pp. 175-180. With F. R. Cross. Two cases of epithel. implantation cyst in anterior chamber after extraction of cataract.

Pp. 180-186. *On the path. examn. of three eyes lost from concussion.*

1893 VOL. XIII.

Pp. 103-106. Report on tumour of the optic nerve.

Pp. 114-127. Microphthalmos.

Pp. 128-139. Congen. defects of the iris and glaucoma.

Pp. 199-207. With F. R. Cross. Epithel. pearl tumour in iris following implantation of eye-lash in anterior chamber.

1894 VOL. XIV.

Pp. 83-86. Case of a primary tumour of the ciliary body of glandular structure.

Pp. 141-149. Two cases of brother and sister with peculiar vascular new growth, probably primarily retinal, affecting both eyes.

Pp. 197-199. Case of patient with congen. excess of pigment in uveal tract and pigment of scl. in one eye which later became seat of melanotic sarcoma.

Pp. 217-218. Three eye-lashes carried into the vitreous chamber by a wound with a knife.

1895 VOL. XV.

Pp. 104-115. Lamellar cataract and rickets.

Pp. 192-193. Polycoria with deep pitting of the optic disc.

Pp. 240-241. Case of enophth. becoming exophth. on stooping.

1896 VOL. XVI.

Pp. 81-86. On origin of ruptures in detached retina.

Pp. 142-149. Four cases of bilateral glioma of retina, cured by enucleation of the two eyes.

Pp. 354-355. *Syphilitic thrombosis of pontine vessels. enoph. and analgesia* of right 5th cranial nerve. With Mott, F.

1897 VOL. XVII.

Pp. 27-29. Ulcer of cornea with extensive pur. infiltration. Treatment with oxygen only—recovery.

Pp. 63-64. Case. Diss. white patches in the choroid with choles. crystals on surface.

P. 249. Report of committee on Snell's case of orbital tumour.

Pp. 254-266. Microph. with cystic protrusion from globe. Congenital abnormalities.

Pp. 266-271. Case of microph. with cyst. Path. report by E.T.C.

Pp. 324-326. Case presenting clin. char. of embolism of central artery of retina, first one eye and then the other.

1898 VOL. XVIII.

Pp. 124-130. On the pathogen. of anterior polar cataract.
Pp. 200-213. On the localisation of foreign bodies in the eye and orbit by Röntgen rays. With Mackenzie Davidson.
Pp. 233-306. Committee on relative value of simple excision.

1899 VOL. XIX.

Pp. 1-5. Case of monilethrix affecting the eye-lashes and eye-brows.
Pp. 30-32. Unusual form of opacity of cornea.
Pp. 53-61. Pigment growth of the iris.
Pp. 209-214. Cases operated on for high myopia.

1900 VOL. XX.

Pp. 156-164. With Devereux Marshall. Two cases of primary neopl. of the optic nerve.
Pp. 190-191. Case with symm. congen. notches in outer part of each lower lid, and defective development of malar bones. Pp. 191-192—same.
Pp. 196-197. Unusual changes in the macular region, ? the result of injury.

1901 VOL. XXI.

P. 43. Histology of lamellar cataract (quoted).
P. 100. With Hinnell, J. S. Diminished tension and the appearance of optic neuritis persisting for nine months after a wound of the orbit by a shot from an air-gun.
P. 121. With Ford, A. Vernon. Case of bullet wound of orbit followed by blindness of both eyes.

1902 VOL. XXII.

P. 144. Case in which Mooren's "rodent ulcer" had six years previously involved the whole surface of the cornea.
P. 148. Case presenting an unusual form of opacity in the central part of each cornea.

1903 VOL. XXIII.

P. 1. Case of favus of the upper eye-lid.
P. 94. With Devereux Marshall. Primary tumours of optic nerve (quoted).
P. 114. Partial atrophy of the optic nerves caused by lightning.
Pp. 163, 168, 171 Histological descriptions of cases of plexiform neuroma of temporal region, orbit, eye-lid and eye-ball
P. 244. With Parsons, J. H. Anophthalmos and microphthalmos in a chick.

1904 VOL. XXIV.

P. 45. An unusual superficial circumferential opacity of the cornea symmetrical in the two eyes.

1905 VOL. XXV.

P. 49. Two children in the same family with congenital opacities of the cornea.
Pp. 248-257. With Batten, Rayner D. Neuro-fibroma of the eyeball and its appendages; clinical notes by Rayner Batten.
Pp. 264-265. Pathological reports on specimens of glioma (case described by Mr. Simeon Snell).
P. 285. Excessive development of check ligaments supposed effect on internal and external recti muscles (quoted).
P. 319. Small coloboma of upper eye-lid, with peculiar thickening of the conjunctiva on its inner surface.

1906 VOL. XXVI.

P. 172. Coloboma of the iris with a bridge (2 cases).
P. 177. With Taylor, S. J. Congenitally malformed cystic eye, causing extensive protrusion of upper eye-lid and complete extrusion of conjunctival sac through the palpebral fissure.

1907 VOL. XXVII.

P. 47. Corneal changes in a case of myxoedema.
P. 67. Experimental reproduction of rupture of membrane of Descemet, attempted by. With George Coats.
P. 208. Adhesion of a persistent pupillary membrane to the cornea of a cat.

1908 VOL. XXVIII.

P. 169. Congenital anterior staphyloma (discussion, p. 184).
P. 223. Case of nodular leprosy affecting the eyes.
P. 225. Symmetrical circumferential encroachment on the cornea by the limbus of the conjunctiva in the two eyes, with an arcus senilis inside the limbus, the patient being also the subject of progressive ptosis.

1909 VOL. XXIX.

P. 136. Lenticonus posterior, with opaque membrane behind lens.

1910 VOL. XXX.

P. 112. Case of wide-spread exudation internal to the choroid and beneath the retinal vessels, giving rise to a white reflex.
P. 263. Primary malignant growth of ciliary body (quoted).
P. 231. Unusual yellow patches in the iris in an eye with leucoma adherens.
P. 232. With Hudson, A. C. Pathological report on microscopical sections of eye, with unusual yellow patches in the iris excised.
P. 281. Pathological report on case of interfascicular endothelioma of the choroid situated at the optic disc.

1911 VOL. XXXI.

P. 396. Cases in which an intradural tumour of the optic nerve was removed with retention of the eye-ball five-and-a-half years ago.

1912 VOL. XXXII.

Pp. 158-173. Case of congenital anterior staphyloma.
P. 193. A case of buphthalmos with full vision and without any cupping of the optic disc.

1913 VOL. XXXIII.

P. 190. Concussion injury with rupture extending across the optic disc.

1914 VOL. XXXIV.

P. 215. An epibulbar epithelioma which completely disappeared after an application of radium bromide.
P. 228. Congenital ectropion of the lower lids.
P. 314. Apparent accommodation with aphakia.
P. 371. Of double facial paralysis.

1915 VOL. XXXV.

Pp. 204-226. Contusion hypotony.
P. 274. Of pigmentary cyst of iris diagnosed during life (quoted).

1917 VOL. XXXVII.

P. 125. Of epibulbar sarcoma cured by removal, and the application of radium.

P. 165. Bilateral multiple angiomata of the retina.

P. 217. An experimental investigation as to some of the effects of hypotony in rabbits' eyes.

1918 VOL. XXXVIII.

P. 165. Abiotrophy of the retinal neuro-epithelium or "retinitis pigmentosa."

1922 VOL. XLII.

P. 88. Hypotheses as to origin of Leber's disease, discussed by.

Pp. 176-177. Over-action of Müller's muscle in Graves' disease (quoted).

Pp. 273-287. On the aetiology of angeioid streaks in the fundus oculi.

1923 VOL. XLIII.

P. 32. Histology of iris and ciliary body.
Method of depigmenting microscopical sections of the eye.

1924 VOL. XLIV.

Pp. 1-13. Presidential Address at Convention of English-speaking Ophthalmological Societies.

1925 VOL. XLV.

P. 86. Intra-ocular melanomata.

1926 VOL. XLVI.

Pp. 124-155. Metaplasia of the tissues of the eyeball.

1927 VOL. XLVII.

P. 83. Warty condition of the ocular conjunctiva invading the cornea following repeated exposures to X-rays.

P. 107. lvlll Notes on the natural history of retinal neoplasms. Origin of melanoblasts (quoted).

1928 VOL. XLVIII.

Pp. 129-141. Theory as to the origin of primary pigmentary degeneration of retina.

P. 166. Formative fibrous tissue reaction in the eye.

1929 VOL. XL.

P. 55. Function of parathyroid glands in relation to lamellar cataract (quoted).

P. 78. Nature of lamellar cataract (quoted).

P. 201. The Harderian gland, xerophthalmia, vitamin A. deficiency, keratomalacia.

1930 VOL. L.

Pp. 10-90. Changes in the visual organs correlated with the adoption of arboreal life, and with the assumption of the erect posture.

British Journal of Ophthalmology.

1932 VOL. XVI.

P. 1. The physiology of weeping.

Mr. Collins also wrote for us the memoirs of the late Mr. Waren Tay, Professor Ernst Fuchs and Mr. Richardson Cross.

NOTES

Deaths

AS we go to press we regret to have to record the death of Mr. Francis Astley Cooper Tyrrell on New Year's Day; and that of Mr. Harry Lee, which occurred with tragic suddenness at Leeds on January 11. We hope to publish notices in our next number.

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Royal Eye Hospital, 75th Anniversary Dinner

A DINNER in celebration of the 75th anniversary of the founding of the Royal Eye Hospital was held on December 9 at the Frascati Restaurant. Viscount Elibank, D.L., the President of the Hospital, was in the Chair. Besides the Honorary Medical Staff there were present Mr. L. V. Cargill, Chairman of the Hospital, Mr. E. Holthouse, Mr. A. W. Ormond, Mr. H. Willoughby-Lyle, Dr. de Bec Turtle, Mr. A. H. Levy, Mrs. Germaine, Miss Grainger-Kerr, Miss Norman, and Mr. F. A. Williamson-Noble (joint Editor of the *British Journal of Ophthalmology*) amongst others.

A message from the King expressing his interest in the Hospital was read. Lord Elibank spoke of the plans for an appeal for £150,000 for a much-needed extension of the Hospital, and Mr. Cargill in responding to the Toast of the Hospital gave a sketch of its history and development. Mrs. Germaine responded to the Toast proposed by Mr. Arnold Sorsby to the memory of her father, John Zachariah Laurence, the founder of the Hospital. The Rev. E. H. Griffiths, R.N., proposed the health of the guests, and Mr. Williamson-Noble responded. A highly enjoyable evening was concluded by the speech of Mr. A. D. Griffith, Senior Surgeon to the Hospital, proposing the Toast of the Chairman.

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National Society for the Prevention of Blindness

THE Third Annual Meeting of the International Association for Prevention of Blindness was held in Paris on November 19, 1932, and the progress achieved in the past year, particularly for the conservation of the vision of school children, was described by delegates from England, Germany, France, Switzerland and the United States.

The history of this movement goes back to 1802 when Franz Von Gaheis, an Austrian, recognized that partially seeing children were quite as much misfits in the schools for the blind as they were in those for the normal sighted; but it was not till 1908, when James Kerr and Bishop Harman established in London the first special classes for myopes, that anything practical was done to

meet the special educational needs of these children. In 1909, Strasbourg, then in Germany, organized a class, and in 1913 the United States formed one in Boston and another in Cleveland. There are now 409 sight-saving classes in the United States, and the proportion of children requiring the advantages of such a class is estimated at one in a thousand of the school population.

The work in these classes conforms as nearly as possible to that in the regular grades. Approximately 5 per cent. of the pupils are able to return to the ordinary school classes at a later date.

The curriculum is modified and substitutions are made rather than omissions. For instance, a child who may not be permitted to illustrate his story in detailed drawing may accomplish the same result by free-hand cutting, modelling or mass painting. Maps are used in outline form, black on buff, or in colours which give sufficient contrast to produce clear definition. In some cases music scores with large type are permitted, and where a child shows decided talent, special attention is given. Vocational guidance is offered and the child is taught to realize his possibilities and limitations in the selection of an occupation.

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The American Braille Press

MRS. CORINNE ROCHELEAU ROULEAU (Washington) and MISS REBECCA MACK (Cincinnati) have conducted a five-year research in the number and status of 887 persons in the United States and 57 in Canada who are both blind and deaf. The report states that some children thus affected have been placed in asylums; the so-called intelligence tests are quite worthless in estimating their mental powers. Some of the cases were refused entrance to schools for the blind because they were deaf and *vice versa*. The methods of communication available to the deaf-blind are Braille, sign language and morse code. In most of the cases the faculty of speech has been retained or acquired.

Some efforts are being made in London, Paris, Berlin and Montreal to register deaf-blind persons who, in the opinion of the authors of this report, "are the most heavily handicapped, the most lonely and the most neglected of all human beings."

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Ophthalmological Society of the United Kingdom

AT the Annual Congress of the Society in May Prof. R. Punnett, F.R.S., will read a paper on "Mendelism." A discussion on "Heredity and Eye Diseases" will be held afterwards to be opened by C. H. Usher, M. van Duyse and Ida C. Mann. The Annual Dinner of the Society will be held on May 11, and the Clinical Meeting will be held at the Central London Ophthalmic Hospital.

Royal London Ophthalmic Hospital

THE Annual Dinner of Past and Present Students of the Royal London Ophthalmic Hospital will be held at the Langham Hotel, Portland Place, on Thursday, February 9, 1933, at 7 for 7.30 o'clock. Sir Arnold Lawson will take the Chair, and the price of the ticket (excluding wine) will be 15/-; to be obtained from Mr. Rupert Scott, 70, Harley Street, W.1.

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Ophthalmological Society of Egypt

THE Annual Meeting of the Ophthalmological Society of Egypt will take place at the Memorial Ophthalmic Laboratory, Giza Ophthalmic Hospital, on March 10, 1933.

FUTURE ARRANGEMENTS

1933

February 3.—North of England Ophthalmological Society, at Newcastle-on-Tyne.

February 10.—Royal Society of Medicine, Section of Ophthalmology.

March 3.—North of England Ophthalmological Society, at Liverpool.

March 10.—Royal Society of Medicine, Section of Ophthalmology (Clinical Meeting).

March 31.—North of England Ophthalmological Society, at Sheffield.

April 4.—Midland Ophthalmological Society, at Oxford Eye Hospital.

April 17-21.—XIV International Ophthalmological Congress, at Madrid.

May 11-13.—Ophthalmological Society of the United Kingdom, Annual Congress, at the Royal Society of Medicine.

May 26.—Midland Ophthalmological Society, at Gloucester Royal Infirmary.

June 9.—Royal Society of Medicine, Section of Ophthalmology (Annual Meeting).

July 5-8.—Oxford Ophthalmological Congress, at Oxford.

October 6.—Midland Ophthalmological Society, Annual Meeting, at Birmingham and Midland Eye Hospital.

December 5.—Midland Ophthalmological Society, at Birmingham and Midland Eye Hospital.

CONTEMPORARY OPHTHALMIC LITERATURE

American Journal of Ophthalmology. *December, 1932.*

ARGAÑARAZ. The treatment of chronic dacryocystitis and lacrimo-nasal fistulization.
STIEREN. Magnet extraction from the vitreous.
LLOYD. The first American eye journal and its editor.
HILL. Papilloedema and intracranial complications of leukemia.
BERRISFORD Effects of intense light on the retina.
FREY. Practice of ophthalmology.
EVANS. Slit-lamp ophthalmoscopy.
CROSSLEY. Intracapsular cataract extraction by the vacuum cup method.
POOS. Present status of diathermy in ophthalmology.
FREIMAN. Sqamous-cell epithelioma at the limbus.

Annales d'Oculistique. *November, 1932.*

REDSLOB and GERY. Ocular localisations in Gaucher's disease.
LAGRANGE. The value of Ranke's conception in the determination of ocular tuberculosis.
TERSON. A powerful iris scissors.
MARIN-AMAT.—Melanotic sarcoma developed on a pterygium.
SAINT-MARTIN. Professor Imre's localising apparatus for retinal tears.
DIMISSIANOS. Secondary fatty degeneration of the iris and anterior chamber (Xanthomatosis bulbi).
BISTIS. Treatment of pterygium by scleropexy.

Archives d'Ophtalmologie. *December, 1932.*

FRENKEL and DEJEAN. Anatomical, aetiological, experimental and clinical study of rupture and tearing of the zonule.
TRANTAS. Applications of diaphanoscopy.
BONNET and PAUFIQUE. Sub-conjunctival lipoma.
DELORD. On a case of considerable bilateral exophthalmos from lesions in the region of the pituitary. Cure by mercurial treatment associated with deep X-rays.

January, 1933.

Report of the Annual Meeting of the International Association of the Prevention of Blindness.
BURGHGRAEVE. Anatomico-pathological study of certain ocular lesions following infection by "Treponema cuniculi."

Revue d'Oto-Neuro-Ophtalmologie. *September-October, 1932.*

HELSMOORTEL, BAUWENS and VAN BOGAERT. The residual symptoms of closed cranio-cerebral injuries. Study of 43 observations from the labryrinthine, ophthalmological and neuro-psychiatric point of view.

November, 1932.

COPPEZ. Late ocular symptoms following focal injuries to the skull.
CREYSSEL and MOUNIER-KUHN. Anatomico-clinical study of a case of post-traumatic nasal causalgia with disturbance of pupil reactions.
DEJEAN and BONNAHON. Two cases of chiasmal hemianopia following non-penetrating injury to the skull with late concussion symptoms.

SEDAN. Persistent exophoria in a boxer following concussion.
EUZIERE, VIALLEFONT and VIDAL. Paralysis of the left superior oblique; anaesthesia, syringo-myelic type, of the arm and the right side of the thorax after cranial injury.
RIMBAUD, CHARDONNEAU and BALMES. A case of cortical blindness.
EUZIERE, DELORD, VIALLEFONT and VIDAL. Intermittent unilateral exophthalmos.
VILLARD, DEJEAN and VIALLEFONT. Von Recklinghausen's disease with left papilloedema in a patient with an injury to the right eye.
HUGHES, CAZEJUST, VIALLEFONT and RATIE. A case of van der Hoeve's syndrome.
VIALLEFONT. Blue spots on the sclerotic.

Archiv für Ophthalmologie.

ZAMENHOF. Ophthalmoscopy in focal and indirect light.
VANCEA. Hyaloid epithelioma of the lid. Cylindroma of the lid.
V. HIPPEL. Demodex folliculorum in a chalazion.
BAURMANN. On the reduction of intra-cranial tension.

Klinische Monatsblätter für Augenheilkunde. *December, 1932.*

HERZAU and PINKUS. Observations on the Schüller-Christianschen disease.
PAUL. Observation on localisation ophthalmoscopy.
ENGELKING and HARTUNG. On a new adaptometer for clinical use.
KAYSER. On the diagnosis and differential diagnosis of megalo-cornea and pigment scattering.
——— On two cases of rare pigmentation of the eye.
HIRSCH. The nasal operation for pituitary tumours.
LÖWENSTEIN. Vitiligo iridis after chicken-pox.
LYDING. Loosening and separation of the anterior layer of the iris stroma.
HELMBOLD. Observation on the use of "red-free" or "green" light.
THORNER. Explanation of the work of Ch. Eidenbenz "The macula lutea and its surroundings in the light of recent methods of red free ophthalmoscopy."

Annali di Ottalmologia e Clinica Oculistica.

June, 1932.

PUSCARIU. Noguchi's Bacterium granulosis and the aetiology of trachoma.
ZANETTIN. Clinical and pathogenical researches on Leber's stellate retinitis.
NARDI. The tolerance of the eye for endo-bulbar foreign bodies.

Archivio di Ottalmologia. *September-October, 1932.*

FEDERICI. On some particular indications for the conjunctival plastic in cataract extraction.
ROSSI. The nuclear inversion of Velez in connection with trachoma and tuberculosis.
GALEAZZI. Lympho-sarcoma of the orbit developing some months after enucleation for metastatic ophthalmitis.

Bollettino d'Oculistica. *November, 1932.*

CHARLIN. Nasal neuritis from general causes.
GUALDI. Technique and results of the practical application of contact glasses with special regard to the correction of ametropia.
PALMERINI. On extraction of intra-ocular cysticercus. A case of cysticercus successfully operated upon.

Lettura Oftalmologica. *August, 1932.*

BAQUIS. *Observations on the development of the human lids with particular regard to the formation of the tarsus.*
PERGOLA. On "acridinica" therapy in septic processes of the eye.

September, 1932.

BAQUIS. *On alterations in the lacrimal sac in chronic dacryo-cystitis.*
BARATTA. Contribution to the study of corneo-conjunctival tuberculosis secondary to lupus of the nose.
VELE. Contribution to the study of teratoma of the external angle of the conjunctival fornix.

Archivos de Oftalmologia Hispano-Americanos. *December, 1932.*

PAVIA. Ocular changes in old tuberculosis.
MARQUEZ. Ocular tuberculosis.

Revista Cubana de Oto-Neuro-Oftalmiatria.

ANGELUCCI. The action of pigment on lymphomatism and trachoma and its racial relation.
GONZALEZ. Non-specific intradermal protein reaction in the progress of ocular *syphilis.*
FERRER. Surgical treatment of detachment of the retina.
PENICHET. Treatment of detached retina by the modified Lindner-Guist method.
YANES. On a case of vertical paralysis of fixation.
GONZALEZ. Monosymptomatic ocular hysteria. Spasm of convergence and *accommodation.*
GARCIA and CESPEDES. Diathermic epilation in ophthalmology.
ESTEBAN. Surgical treatment of pulsating exophthalmos.
——— Acute papillitis.

Revista Oto-Neuro-Oftalmologica. *November, 1932.*

PAVIA. A case of hole at the macula from severe irido-cyclitis of unknown origin.

December, 1932.

COSTI. The electrical method of the extraction of cataract. Electro-diaphakia of Lacarrère.
PAVIA, DUSSELDORP and BIANCHI. Vegetating pseudo-tuberculosis of the palpebral conjunctiva in a case of phthisis.
PAVIA. Vitreous haemorrhage in to the canal of Cloquet.
——— A previously undescribed form of persistent pupillary membrane.

January, 1933.

PAVIA and DUSSELDORP. Phlebitis and haemorrhage of the retina in tuberculosis.
PAVIA. The fundus oculi; its cinematography.